Thank you for choosing this Mitsubishi Transistorized inverter.

If this is the first time for you to use the FR-S500 series, please read through this instruction manual (basic) carefully and use the inverter safely.

If you are going to use the inverter for higher-level applications, the FR-S500 instruction manual (detailed) is separately available from where you purchased the inverter or a Mitsubishi sales representative.
1. Electric Shock Prevention

**WARNING**

- While power is on or when the inverter is running, do not open the front cover. You may get an electric shock.
- Do not run the inverter with the front cover removed. Otherwise, you may access the exposed high-voltage terminals or the charging part of the circuitry and get an electric shock.
- Even if power is off, do not remove the front cover except for wiring or periodic inspection. You may access the charged inverter circuits and get an electric shock.
- Before starting wiring or inspection, check to make sure that the 3-digit LED inverter monitor is off, wait for at least 10 minutes after the power supply has been switched off, and check to make sure that there are no residual voltage using a tester or the like.
- This inverter must be earthed (grounded). Earthing (grounding) must conform to the requirements of national and local safety regulations and electrical codes (JIS, NEC section 250, IEC 536 class 1 and other applicable standards).
- Any person who is involved in the wiring or inspection of this equipment should be fully competent to do the work.
- Always install the inverter before wiring. Otherwise, you may get an electric shock or be injured.
- Perform setting dial and key operations with dry hands to prevent an electric shock. You may get an electric shock.
- Do not subject the cables to scratches, excessive stress, heavy loads or pinching. Otherwise, you may get an electric shock.
- Do not change the cooling fan while power is on. It is dangerous to change the cooling fan while power is on.
- When you have removed the front cover, do not touch the connector above the 3-digit monitor LED display. Otherwise, you get an electric shock.
2. Fire Prevention

**CAUTION**
- Mount the inverter and brake resistor on an incombustible surface. Installing the inverter and brake resistor directly on or near a combustible surface could lead to a fire.
- If the inverter has become faulty, switch off the inverter power. A continuous flow of large current could cause a fire.
- When using a brake resistor, make up a sequence that will turn off power when an alarm signal is output. Otherwise, the brake resistor may excessively overheat due to damage of the brake transistor and such, causing a fire.
- Do not connect a resistor directly to the DC terminals P, N. This could cause a fire.

3. Injury Prevention

**CAUTION**
- Apply only the voltage specified in the instruction manual to each terminal to prevent damage, etc.
- Always connect to the correct terminal to prevent damage, etc.
- Always make sure that polarity is correct to prevent damage, etc.
- While power is on or for some time after power-off, do not touch the inverter as it is hot and you may get burnt.

4. Additional Instructions

Also note the following points to prevent an accidental failure, injury, electric shock, etc.

(1) Transportation and installation

**CAUTION**
- When carrying products, use correct lifting gear to prevent injury.
- Ensure that installation position and material can withstand the weight of the inverter. Install according to the information in the instruction manual.
- Do not operate if the inverter is damaged or has parts missing.
- When carrying the inverter, do not hold it by the front cover or setting dial; it may fall off or fail.
- Do not stand or rest heavy objects on the inverter.
- Check the inverter mounting orientation is correct.
- Prevent screws, wire fragments, other conductive bodies, oil or other flammable substances from entering the inverter.
- As the inverter is a precision instrument, do not drop or subject it to impact.
- Use the inverter under the following environmental conditions: This could cause the inverter damage.

<table>
<thead>
<tr>
<th>Environment</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient Temperature</td>
<td>-10°C to +50°C (non-freezing) (-10°C to +40°C for totally enclosed structure feature)</td>
</tr>
<tr>
<td>Ambient humidity</td>
<td>80%RH maximum (non-condensing)</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-20°C to +65°C *</td>
</tr>
<tr>
<td>Atmosphere</td>
<td>Indoors (free from corrosive gas, flammable gas, oil mist, dust and dirt)</td>
</tr>
<tr>
<td>Altitude/ Vibration</td>
<td>Max 1000m above sea level 5.9m/s² or less (conforming to JIS C 0040)</td>
</tr>
</tbody>
</table>

*Temperatures applicable for a short time, e.g. in transit.
(2) Wiring

**CAUTION**
- Do not fit capacitive equipment such as power factor correction capacitor, radio noise filter (option FR-BIF) or surge suppressor to the output of the inverter.
- The connection orientation of the output cables U, V, W to the motor will affect the direction of rotation of the motor.

(3) Trial run

**CAUTION**
- Check all parameters, and ensure that the machine will not be damaged by a sudden start-up.

(4) Operation

**WARNING**
- When you have chosen the retry function, stay away from the equipment as it will restart suddenly after an alarm stop.
- The [STOP] key is valid only when the appropriate function setting has been made. Prepare an emergency stop switch separately.
- Make sure that the start signal is off before resetting the inverter alarm. A failure to do so may restart the motor suddenly.
- The load used should be a three-phase induction motor only. Connection of any other electrical equipment to the inverter output may damage the equipment.
- Do not modify the equipment.

**CAUTION**
- The electronic thermal relay function does not guarantee protection of the motor from overheating.
- Do not use a magnetic contactor on the inverter input for frequent starting/stopping of the inverter.
- Use a noise filter to reduce the effect of electromagnetic interference. Otherwise nearby electronic equipment may be affected.
- Take measures to suppress harmonics. Otherwise power supply harmonics from the inverter may heat/damage the power capacitor and generator.
- When parameter clear or all clear is performed, each parameter returns to the factory setting. Re-set the required parameters before starting operation.
- The inverter can be easily set for high-speed operation. Before changing its setting, fully examine the performances of the motor and machine.
- In addition to the inverter’s holding function, install a holding device to ensure safety.
- Before running an inverter which had been stored for a long period, always perform inspection and test operation.
(5) Emergency stop

**CAUTION**

- Provide a safety backup such as an emergency brake which will prevent the machine and equipment from hazardous conditions if the inverter fails.
- When the breaker on the inverter primary side trips, check for the wiring fault (short circuit), damage to internal parts of the inverter, etc. Identify the cause of the trip, then remove the cause and power on the breaker.
- When any protective function is activated, take the appropriate corrective action, then reset the inverter, and resume operation.

(6) Maintenance, inspection and parts replacement

**CAUTION**

- Do not carry out a megger (insulation resistance) test on the control circuit of the inverter.

(7) Disposing of the inverter

**CAUTION**

- Treat as industrial waste.

(8) General instructions

Many of the diagrams and drawings in this instruction manual (basic) show the inverter without a cover, or partially open. Never operate the inverter in this manner. Always replace the cover and follow this instruction manual (basic) when operating the inverter.
Unpack the inverter and check the capacity plate on the front cover and the rating plate on the inverter side face to ensure that the product agrees with your order and the inverter is intact.

Harmonic Suppression Guideline

The “harmonic suppression guideline for household appliances and general-purpose products” issued by the Japanese Ministry of Economy, Trade and Industry (formerly Ministry of International Trade and Industry) in September 1994 applies to the FR-S500 series. By installing the power factor improving reactor (FR-BEL or FR-BAL), this product conforms to the “harmonic suppression technique for transistorized inverters (input current 20A or less)” set forth by the Japan Electrical Manufactures' Association.

Product Checking and Parts Identification

Unpack the inverter and check the capacity plate on the front cover and the rating plate on the inverter side face to ensure that the product agrees with your order and the inverter is intact.

- Parts and name plate
  Operation panel
  Front cover
  Wiring cover

- Inverter type
  FR-S520E-0.1K

- Capacity plate
  FR-S520E-0.1K
  FR-S520E-0.75K
  FR-S520E-1.5K
  FR-S520E-3.7K

- Structure, terminal symbol, etc.
  **Enclosed type**
  IP40

- RS-485 communication function
  When using the RS-485 connector to wire the cable, you can cut off the tab of the wiring cover to wire it. (Cutting off the tab will provide protective structure IP10.)

CAUTION

The connector above the operation panel is for manufacturer use. Do not touch it as doing so may cause an electric shock.
1. CONNECTION OF PERIPHERAL DEVICES

1.1 Basic configuration

- **Power supply**
  Use within the permissible power supply specifications of the inverter. (Refer to page 62.)

- **No-fuse breaker or earth leakage circuit breaker**
  The breaker must be selected carefully since an in-rush current flows in the inverter at power on.

- **Magnetic contactor**
  Install for your safety. Do not use this magnetic contactor to start and stop the inverter. Doing so will cause the inverter life to be shortened. (Refer to page 12.)

- **Installation of a reactor**
  A reactor must be used when the power factor is to be improved or the inverter is installed near a large supply system (500kVA or more and wiring distance within 10m).
  Make the selection carefully.

- **DC reactor (FR-BEL)**

- **Inverter**
  The life of the inverter is influenced by ambient temperature. Check the ambient temperature.
  Especially when mounting the inverter inside an enclosure, take precautions of the ambient temperature. (Refer to page 64.)

- **Wrong wiring might lead to damage of the inverter**
  The control signal wires must be kept fully away from the main circuit to protect them from noise.
  (Refer to page 5.)

- **Devices connected to the output**
  Do not install a power factor correction capacitor, surge suppressor or radio noise filter on the output side of the inverter.
  When installing a no-fuse breaker on the output side of the inverter, contact each manufacturer for selection of the no-fuse breaker.

- **Earth (Ground)**
  To prevent an electric shock, always earth (ground) the motor and inverter.
  For reduction of induction noise from the power line of the inverter, it is recommended to wire the earth (ground) cable by returning it to the earth (ground) terminal of the inverter.
  (For details of noise reduction techniques, refer to the instruction manual [detailed].)
### Selection of peripheral devices

- **FR-S520E-0.1K to 3.7K(-C)**

<table>
<thead>
<tr>
<th>Motor Output (kW)</th>
<th>Applicable Inverter Type</th>
<th>No-fuse Breaker (NFB)(^*1) or Earth Leakage Circuit Breaker (ELB)(^*2)</th>
<th>Magnetic Contactor (MC)</th>
<th>Power Factor Improving AC Reactor</th>
<th>Power Factor Improving DC Reactor</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>FR-S520E-0.1K(-C)</td>
<td>30AF/5A S-N10</td>
<td>FR-BAL-0.4K(^*3)</td>
<td>FR-BEL-0.4K(^*3)</td>
<td></td>
</tr>
<tr>
<td>0.2</td>
<td>FR-S520E-0.2K(-C)</td>
<td>30AF/5A S-N10</td>
<td>FR-BAL-0.4K(^*3)</td>
<td>FR-BEL-0.4K(^*3)</td>
<td></td>
</tr>
<tr>
<td>0.4</td>
<td>FR-S520E-0.4K(-C)</td>
<td>30AF/5A S-N10</td>
<td>FR-BAL-0.4K(^*3)</td>
<td>FR-BEL-0.4K(^*3)</td>
<td></td>
</tr>
<tr>
<td>0.75</td>
<td>FR-S520E-0.75K(-C)</td>
<td>30AF/10A S-N10</td>
<td>FR-BAL-0.75K(^*3)</td>
<td>FR-BEL-0.75K(^*3)</td>
<td></td>
</tr>
<tr>
<td>1.5</td>
<td>FR-S520E-1.5K(-C)</td>
<td>30AF/15A S-N10</td>
<td>FR-BAL-1.5K</td>
<td>FR-BEL-1.5K</td>
<td></td>
</tr>
<tr>
<td>2.2</td>
<td>FR-S520E-2.2K(-C)</td>
<td>30AF/20A S-N10</td>
<td>FR-BAL-2.2K</td>
<td>FR-BEL-2.2K</td>
<td></td>
</tr>
<tr>
<td>3.7</td>
<td>FR-S520E-3.7K(-C)</td>
<td>30AF/30A S-N20, S-N21</td>
<td>FR-BAL-3.7K</td>
<td>FR-BEL-3.7K</td>
<td></td>
</tr>
</tbody>
</table>

*1. Select the NFB according to the inverter power supply capacity. Install one NFB per inverter.

*2. For installations in the United States or Canada, the circuit breaker must be inverse time or instantaneous trip type.

*3. The power factor may be slightly lower.

*4. When the breaker on the inverter primary side trips, check for the wiring fault (short circuit), damage to internal parts of the inverter, etc. Identify the cause of the trip, then remove the cause and power on the breaker.
2. INSTALLATION METHOD

2.1 Installation of the inverter

Install the inverter under the following conditions.

- Inverter consists of precision mechanical and electronic parts. Never install or handle it in any of the following conditions as doing so could cause an operation fault or failure.

- Install the inverter under the following conditions.

- When containing two or more inverters, install them in parallel and provide cooling measures.

- Leave enough clearances and provide cooling measures.

- Ambient temperature and humidity:
  - Temperature: -10°C to 50°C
  - Humidity: 90%RH maximum

- Clearances:
  - 10cm or more
  - 1cm or more
  - 1cm or more

- Measurement position:
  - 5cm or more

- Direct sunlight
- Vibration (5.9m/s² or more)
- High temperature, high humidity
- Horizontal placement
- Oil mist, flammable gas, corrosive gas, fluff, dust, etc.
- Vertical mounting (when mounted inside enclosure)
- Transportation by holding front cover or dial
- Mounting to combustible material

- Enclosure surface mounting
- Mounting inside enclosure

Fix the front cover and wiring cover after removing them.

When containing two or more inverters, install them in parallel and provide cooling measures.
3. SPECIFICATIONS OF WIRING AND TERMINALS

3.1 Terminal connection diagram

- Three-phase 200V power input

**REMARKS**

1. The N/- terminal is provided for the 1.5K or more.
2. The PR terminal is provided for the 0.4K or more.
3. Not needed when the setting dial is used for calibration. Used when calibration must be made near the frequency meter for such a reason as a remote frequency meter. However, the frequency meter needle may not deflect to full-scale if the calibration resistor is connected. In this case, use this resistor and setting dial together.
4. You can switch the position of sink and source logic. Refer to the instruction manual (detailed) for details.
5. The terminal functions change with input terminal function selection (Pr. 60 to Pr. 63). (Refer to page 35.)
6. The terminal function changes with the setting output terminal function selection (Pr. 64, Pr. 65). (Refer to page 36.)

---

**SPECIFICATIONS OF WIRING AND TERMINALS**

3...
3.2 Main circuit

3.2.1 Explanation of main circuit terminals

<table>
<thead>
<tr>
<th>Terminal Symbol</th>
<th>Terminal Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>R/L1, S/L2, T/L3</td>
<td>AC power input</td>
<td>Connect to the commercial power supply</td>
</tr>
<tr>
<td>U, V, W</td>
<td>Inverter output</td>
<td>Connect a three-phase squirrel-cage motor</td>
</tr>
<tr>
<td>P/+, PR</td>
<td>Brake resistor connection</td>
<td>Connect the optional brake resistor (MRS/MYS type, FR-ABR)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(The brake resistor cannot be connected to the 0.1K or 0.2K.)</td>
</tr>
<tr>
<td>N/-</td>
<td>DC voltage common</td>
<td>DC voltage common terminal. This is not insulated from the power and inverter output. (The N/- terminal is not provided for the 0.75K or less.)</td>
</tr>
<tr>
<td>P/+, P1</td>
<td>Power factor improving DC reactor</td>
<td>Remove the jumper across terminals P/+-P1 and connect the optional power factor improving DC reactor (FR-BEL).</td>
</tr>
<tr>
<td></td>
<td>connection</td>
<td></td>
</tr>
<tr>
<td>☑</td>
<td>Earth (ground)</td>
<td>For earthing (grounding) the inverter chassis. Must be earthed (grounded).</td>
</tr>
</tbody>
</table>
### 3.2.2 Layout and wiring of main circuit terminals

- **FR-S520E-0.1K, 0.2K (-C)**
- **FR-S520E-1.5K, 2.2K, 3.7K (-C)**
- **FR-S520E-0.4K, 0.75K (-C)**

**CAUTION**
- Make sure the power cables are connected to the R, S, T of the inverter. Never connect the power cable to the U, V, W of the inverter. (Phase need not be matched)
- Connect the motor to U, V, W. At this time, turning on the forward rotation switch (signal) rotates the motor in the counterclockwise direction when viewed from the motor shaft.
### 3.2.3 Cables, wiring length, and crimping terminals

The following table indicates a selection example for the wiring length of 20m.

1) FR-S520E-0.1K to 3.7K (-C)

<table>
<thead>
<tr>
<th>Applicable Inverter</th>
<th>Tightening Torque N·m</th>
<th>Crimping Terminal</th>
<th>Cable Pvc Insulation</th>
<th>Cable mm²</th>
<th>AWG</th>
<th>mm²</th>
</tr>
</thead>
<tbody>
<tr>
<td>FR-S520E-0.1K to 0.79K (-C)</td>
<td>M3.5 1.2</td>
<td>2-3.5</td>
<td>2</td>
<td>2</td>
<td>14</td>
<td>2.5</td>
</tr>
<tr>
<td>FR-S520E-1.5K, 2.2K (-C)</td>
<td>M4 1.5</td>
<td>2-4</td>
<td>2</td>
<td>2</td>
<td>14</td>
<td>2.5</td>
</tr>
<tr>
<td>FR-S520E-3.7K (-C)</td>
<td>M4 1.5</td>
<td>5.5-6.5</td>
<td>3.5</td>
<td>12</td>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Wiring length 100m maximum.

**CAUTION**

- When the wiring length of the 0.1K or 0.2K is 30m or more, use the carrier frequency to 1kHz.
- When automatic torque boost is selected in Pr. 98 "automatic torque boost selection (motor capacity)", the wiring length must be 30m maximum. (Refer to page 33.)
### Control Circuit

#### 3.3.1 Explanation of Control Circuit Terminals

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Terminal Name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>STF</td>
<td>Forward rotation start</td>
<td>Turn on the STF signal to start forward rotation and turn it off to stop. When the STF and STR signals are turned on simultaneously, the stop command is given.</td>
</tr>
<tr>
<td>STR</td>
<td>Reverse rotation start</td>
<td>Turn on the STR signal to start reverse rotation and turn it off to stop. The terminal functions change with input terminal function selection (Pr. 60 to Pr. 63). (*4)</td>
</tr>
<tr>
<td>RH</td>
<td>Multi-speed selection</td>
<td>Turn on the RH and RM signals in appropriate combinations to select multiple speeds. The priorities of the speed commands are in order of jog, multi-speed setting (RH, RM, RL, REX) and AU.</td>
</tr>
<tr>
<td>RM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SD</td>
<td>Contact input common (sink)</td>
<td>Common to the contact input terminals (STF, STR, RH, RM, RL) and terminal FM. (*7)</td>
</tr>
<tr>
<td>PC</td>
<td>External transistor common, 24VDC power supply, contact input common (source)</td>
<td>When connecting the transistor output (open collector output), such as a programmable controller (PLC), connect the positive external power supply for transistor output to this terminal to prevent a malfunction caused by undesirable currents. This terminal can be used as a 24VDC, 0.1A power output across terminals PC-SD. When source logic has been selected, this terminal serves as a contact input common.</td>
</tr>
<tr>
<td>10</td>
<td>Frequency setting power supply</td>
<td>5VDC, Permissible load current 10mA.</td>
</tr>
<tr>
<td>2</td>
<td>Frequency setting (voltage)</td>
<td>By entering 0 to 5VDC (0 to 10VDC), the maximum output speed is reached at 5V (10V) and I/O are proportional. Switch between 5V and 10V using Pr. 73 “0-5V, 0-10V selection”. Input resistance 10kΩ. Maximum permissible input voltage 20V.</td>
</tr>
<tr>
<td>4</td>
<td>Frequency setting (current)</td>
<td>Input 4 to 20mADC. It is factory set at 0Hz for 4mA and at 60Hz for 20mA. Maximum permissible input current 30mA. Input resistance approximately 250Ω. Turn ON signal AU for current input. Turning the AU signal on makes voltage input invalid. Use any of Pr. 60 to Pr. 63 (input terminal function selection) to set the AU signal.</td>
</tr>
<tr>
<td>5</td>
<td>Frequency setting input common</td>
<td>Frequency setting signal (terminal 2, 4) common terminal (*7)</td>
</tr>
</tbody>
</table>
1. Do not connect terminals SD and PC each other or to the earth (ground).

For sink logic (factory setting), terminal SD acts as the common terminal of contact input.
For source logic, terminal PC acts as the common terminal of contact input. (Refer to the separately available instruction manual (detailed) for switching method.)

2. Low indicates that the open collector output transistor is on (conducts). High indicates that the transistor is off (does not conduct).

3. For details of RS-485 communication, refer to the separately available instruction manual (detailed).

4. RL, RM, RH, RT, AU, STOP, MRS, OH, REX, JOG, RES, X14, X16, (STR) signal selection

5. RUN, SU, OL, FU, RY, Y12, Y13, FDN, FUP, RL, Y93, Y95, LF, ABC signal selection

6. To be compliant with the European Directive (Low Voltage Directive), the operating capacity of relay outputs (A, B, C) should be 30VDC 0.3A.

7. Terminals SD, SE and 5 are isolated from each other. Do not earth (ground).

---

### Output signals

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Terminal Name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Alarm output</td>
<td>A contact output which indicates that the protective function of the inverter is activated to stop output. 230VAC 0.3A, 30VDC 0.3A. Alarm: discontinuity across B-C (continuity across A-C), Normal: continuity across B-C (discontinuity across A-C). [^6]</td>
</tr>
<tr>
<td>B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RUN</td>
<td>Inverter running</td>
<td>Switched low when the inverter output frequency is equal to or higher than the starting frequency (factory set to 0.5Hz variable). Switched high during stop or DC injection brake operation. [^2] Permissible load 24VDC 0.1A</td>
</tr>
<tr>
<td>SE</td>
<td>Open collector common</td>
<td>Common terminal for inverter running terminal RUN. [^7]</td>
</tr>
<tr>
<td>FM</td>
<td>For meter</td>
<td>The output signal across terminals FM-SD is factory set to about 1mA at 60Hz and is proportional to the corresponding output frequency. Since output voltage is pulse shape, a digital meter can be connected. Frequency permissible load current 1mA Pulse specification 1440 pulses/s at 60Hz</td>
</tr>
<tr>
<td>RS-485 connector</td>
<td>Using the parameter unit connection cable (FR-CB201 to 205), the parameter unit (FR-PU04) can be connected. Communication operation can be performed using RS-485.</td>
<td></td>
</tr>
</tbody>
</table>

---

[^6]: [^1] for sink logic (factory setting), terminal SD acts as the common terminal of contact input. (Refer to the separately available instruction manual (detailed) for switching method.)

[^2]: Low indicates that the open collector output transistor is on (conducts). High indicates that the transistor is off (does not conduct).

[^3]: For details of RS-485 communication, refer to the separately available instruction manual (detailed).

[^4]: RL, RM, RH, RT, AU, STOP, MRS, OH, REX, JOG, RES, X14, X16, (STR) signal selection

[^5]: RUN, SU, OL, FU, RY, Y12, Y13, FDN, FUP, RL, Y93, Y95, LF, ABC signal selection

[^6]: To be compliant with the European Directive (Low Voltage Directive), the operating capacity of relay outputs (A, B, C) should be 30VDC 0.3A.

[^7]: Terminals SD, SE and 5 are isolated from each other. Do not earth (ground).
3.3.2 Arrangement and wiring of control circuit terminals

Control circuit terminal block

<table>
<thead>
<tr>
<th>Terminal Screw Size</th>
<th>Bar Terminal Model (With Insulation Sleeve)</th>
<th>Bar Terminal Model (Without Insulation Sleeve)</th>
<th>Wire Size (mm²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M3 (A, B, C terminals)</td>
<td>A 0.5-2WH</td>
<td>A 0.75-6GY</td>
<td>A 0.5-6</td>
</tr>
<tr>
<td>M2 (Other than the above)</td>
<td>A 0.5-2WH</td>
<td>A 0.75-6GY</td>
<td>0.3 to 0.5</td>
</tr>
</tbody>
</table>

<CAUTION>

- When using the bar terminal (without insulation sleeve), use care so that the twisted wires do not come out.
- Do not plug the connector to a computer LAN board, fax modem socket, telephone modular connector etc. As they are different in electrical specifications, the inverter may be damaged.

3.3.3 Connection to RS-485 connector

(1) When connecting the parameter unit

Use the optional FR-CB2. When the parameter unit (FR-PU04) is used, operation from the operation panel is not accepted. ( is valid)

(2) RS-485 communication

Using the RS-485 connector, you can perform communication operation from a personal computer etc. By connecting the RS-485 connector to computers such as personal computer and FA with a communication cable, you can run/monitor the inverter and read/write parameter values using a user program. For further details, refer to the instruction manual (detailed).
- Conforming standard: EIA Standard RS-485
- Transmission format: Multi-drop link
- Communication speed: Maximum 19200 bps
- Overall extension: 500m

<CAUTION>

Undertightening can cause cable disconnection or malfunction. Over tightening can cause a short circuit or malfunction due to damage to the screw or unit.

- Cable size: 0.3mm² to 0.75mm²
- Screwdriver: Small flat-blade screwdriver (Tip thickness: 0.4mm, tip width: 2.5mm)
3.3.4 Power-off and magnetic contactor (MC)

(1) Inverter primary side magnetic contactor (MC)

On the inverter’s primary side, it is recommended to provide an MC for the following purposes. (Refer to page 3 for selection)

1) To release the inverter from the power supply when the inverter protective function is activated or the drive becomes faulty (e.g. emergency stop operation).

When cycle operation or heavy-duty operation is performed with an optional brake resistor connected, overheat and burnout of the electrical-discharge resistor can be prevented if a regenerative brake transistor is damaged due to insufficient heat capacity of the electrical-discharge resistor and excess regenerative brake duty.

2) To prevent any accident due to an automatic restart at restoration of power after an inverter stop made by a power failure.

3) To rest the inverter for an extended period of time.

The control power supply for inverter is always running and consumes a little power. When stopping the inverter for an extended period of time, powering off the inverter will save power slightly.

4) To separate the inverter from the power supply to ensure safe maintenance and inspection work.

As the inverter’s primary MC is used for the above purposes, select the one of class JEM1038-AC3 for the inverter input side current when making an emergency stop during normal operation.

(2) Handling of secondary side magnetic contactor

In principle, do not provide a magnetic contactor between the inverter and motor and switch it from off to on during operation. If it is switched on during inverter operation, a large inrush current may flow, stopping the inverter due to overcurrent shut-off. When an MC is provided for switching to the commercial power supply, for example, switch it on/off after the inverter and motor have stopped.
4. RUN AND OPERATION

<Operation panel>
The operation panel cannot be removed from the inverter.

- **RUN indication**
  Turns on/flickers* to indicate operation.

- **PU indication**
  Lit to indicate the PU operation mode.

- **3-digit monitor LED**
  Shows the frequency, parameter number, etc.

- **EXT indication**
  Lit to indicate the external operation mode.

- **Setting dial**
  (Setting dial: Mitsubishi inverter's dial)
  Used to change the frequency setting and parameter values.

  This dial cannot be removed.

- **MODE Key**
  Used to change the setting mode.

- **SET Key**
  Used to define each setting.

- **RUN Key**
  Used to switch between the PU and external operation mode.
  When using the external operation mode (operation using the separately connected frequency setting potentiometer and start signal), press this key to light up the EXT indication.
  (Change the Pr. 79 value to use the combined mode.)

  PU: PU operation mode
  EXT: External operation mode

- **PU/EXT Key**
  Used to give the forward rotation operation command.
  Use Pr. 17 to set reverse operation.

- **STOP/RESET Key**
  Used to stop operation or reset an alarm.

** REMARKS **

- When the parameter unit (FR-PU04) is used, operation from the operation panel is not accepted. ( is valid)

* RUN indication
  On: Indicates that forward rotation operation is being performed.
  Slow flickering (1.4s cycle): Indicates reverse rotation.
  Fast flickering (0.2s cycle): Indicates that operation is not being performed but the was pressed or the start command was given.

** PU/EXT indication
  Flickers slowly in the computer link operation mode.
<Basic operation> (factory setting)

1. **Monitor/frequency setting**
   - Press **MODE** key.
   - Turn the setting dial to match frequency.
   - Press **SET** key to show present setting.

2. **Parameter setting**
   - Press **MODE** key.
   - Turn the setting dial to match frequency.
   - Press **SET** key to complete setting.

3. **Alarm history**
   - Four past alarms can be displayed with the setting dial.
   - The latest alarm is ended by ".".
   - When no alarm exists, "---" is displayed.

4. **Frequency setting**
   - After setting is completed, press the **MODE** key once to show alarm history, or twice to show frequency setting screen.
   - Frequency setting has been written and completed!! (and frequency flickers.)
   - Press **RUN** to start.
   - Press **STOP** to stop.

[Operation panel is used for operation]
4.1 Setting the frequency to perform operation (example: performing operation at 30Hz)

**POINT**

- Set “0” (setting dial frequency setting mode) in Pr. 53 “frequency setting operation selection”.

<table>
<thead>
<tr>
<th>Operation</th>
<th>Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Screen at power-on</td>
<td>PU&lt;br&gt;EXT&lt;br&gt;0.0&lt;br&gt;0.0</td>
</tr>
<tr>
<td>2. Press the &lt;button&gt; to choose the PU operation mode.</td>
<td>PU&lt;br&gt;EXT&lt;br&gt;300&lt;br&gt;30</td>
</tr>
<tr>
<td>3. Turn the &lt;button&gt; to show the frequency you want to set.</td>
<td>PU&lt;br&gt;EXT&lt;br&gt;300&lt;br&gt;F</td>
</tr>
<tr>
<td>4. While the value is flickering, press the &lt;button&gt; to set the frequency.</td>
<td>3s later&lt;br&gt;0.0&lt;br&gt;300&lt;br&gt;30</td>
</tr>
<tr>
<td>5. After the value flickered for about 3s, the display returns to 0.0 (monitor display). Press the &lt;button&gt; to start operation.</td>
<td>PU&lt;br&gt;EXT&lt;br&gt;300&lt;br&gt;30</td>
</tr>
<tr>
<td>6. To change the set frequency, perform the operation in above steps 3 and 4. (Starting from the previously set frequency.)</td>
<td>PU&lt;br&gt;EXT&lt;br&gt;300&lt;br&gt;30</td>
</tr>
<tr>
<td>7. Press the &lt;button&gt; to stop.</td>
<td>PU&lt;br&gt;EXT&lt;br&gt;0.0&lt;br&gt;0.0</td>
</tr>
</tbody>
</table>

?- Operation cannot be performed at the set frequency ... Why?
   - Did you carry out step 4 within 5s after step 3?
   - (Did you press the <button> within 5s after turning the setting dial?)

?- Setting of higher than 60Hz cannot be made ... Why?
   - Check to see if the Pr. 1 “maximum frequency” setting is 60Hz.

?- The frequency does not change by turning the setting dial ... Why?
   - Check to see if the operation mode selected is the external operation mode.

**REMARKS**

- Pressing the setting dial shows the set frequency.
- The setting dial can also be used like a potentiometer to perform operation. (Refer to page 16.)
4.2 Using the setting dial like a potentiometer to perform operation

**POINT**
- Set "1" (extended function parameter valid) in Pr. 30 "extended function display selection".
- Set "1" (setting dial potentiometer mode) in Pr. 53 "frequency setting operation selection".

**Operation example:** Changing the frequency from 0Hz to 60Hz during operation

1. **Operation**
   - Model/monitor check:
     - Choose monitor/frequency monitor.
     - The inverter must be in the PU operation mode. (Press the \(\bigcirc\))
     - Pr. 30 must be set to "1".
     - Pr. 53 must be set to "1".
   
   **Display**
   
   2. Press the \(\bigcirc\) to start the inverter.

   **Operation**
   
   3. Turn the \(\bigcirc\) clockwise until "60.0" appears.
   The flickering frequency is the set frequency.
   You need not press the \(\bigcirc\).

   **Display**

   Flickers for 3s.

**REMARKS**

- If flickering "60.0" turns to "0.0", the Pr. 53 "frequency setting operation selection" setting may not be "1".
- Independently of whether the inverter is running or at a stop, the frequency can be set by merely turning the dial.
4.3 Setting the parameters

4.3.1 Example: Changing the Pr. 7 setting from "5s" to "10s"
(For parameter details, refer to the instruction manual (detailed.))

1. Confirm the RUN indication and operation mode indication.
   • The inverter must be at a stop.
   • The inverter must be in the PU operation mode. (Press the MODE button.)
2. Press the MODE (PU button) to choose the parameter setting mode.
3. Turn the SET knob until the desired parameter number appears.
   Example: Pr. 7 "acceleration time"
4. Press the SET button to read the currently set value.
   Example: "5" (factory setting) appears.
5. Turn the SET knob until the desired value appears.
   Example: To change setting from "5" to "10".
6. Press the SET button to set the value.

Flicker...Parameter setting complete!!
   • By turning the SET knob, you can read another parameter.
   • Press the SET button to show the setting again.
   • Press the SET button twice to show the next parameter.

After parameter setting is complete, press the SET button once to show the alarm history of twice to return to the monitor display. To change the setting of another parameter, perform the operation in above steps 3 to 6.

? Error display?
- "E-1" • If write was performed with "1" set in Pr. 77
- "E-2" • If the operation panel does not have the write precedence
   • If write was performed during operation
   • If write was performed in the external operation mode

Remarks
- If the setting has not been changed, the value does not flicker and the next parameter number appears.
- Either step 1 or 2 may be carried out first.
- Convenient usage
   After carrying out steps 1 and 2 to choose the parameter setting mode, you can read a series of parameter numbers in due order every time you press the SET button.
4.3.2 Example: Changing the Pr. 30 setting from "0" to "1"
(The extended parameters are made valid by setting "1" in Pr. 30 "extended function display selection". Refer to page 31 for the extended function parameter list and to the instruction manual (detailed) for details.)

---

**Operation**

1. Confirm the RUN indication and operation mode indication.
   - The inverter must be at a stop.
   - The inverter must be in the PU operation mode. (Press the \( \text{RUN} \) \( \text{PU} \)).

2. Press the \( \text{PU} \) to choose the parameter setting mode.

3. Turn the \( \text{Pr.} \) until \( \text{Pr. 30} \) appears.

4. Press the \( \) to read the currently set value.
   - "0" (factory setting) appears.

5. Turn the \( \) to change it to the set value of "1".

6. Press the \( \text{Pr.} \) to set the value.
   - Flicker...Parameter setting complete!!

---

**Display**

- By turning the \( \), you can read another parameter.
- Press the \( \) to show the setting again.
- Press the \( \) twice to show the next parameter.

After parameter setting is complete, press the \( \) once to show the alarm history or twice to return to the monitor display. To change the setting of another parameter, perform the operation in above steps 3 to 6.

---

**Error display?**

- **E-**
  - If the operation panel does not have the write precedence
  - If write was performed during operation.
  - If write was performed in the external operation mode

---

**REMARKS**

If the setting has not been changed, the value does not flicker and the next parameter number appears.
4.4 Clearing the parameters

**Clearing the parameters**

- **The clear parameter CLR is an extended parameter. Set “1” in Pr. 30 and turn the dial to show it. (Refer to page 18.)**
- **The parameters can be cleared by setting “1” in CLR “parameter clear”.

## Operation

1. Confirm the RUN indication and operation mode indication.
   - The inverter must be at a stop.
   - The inverter must be in the PU operation mode. (Press the SET button.)
2. Press the SET button to choose the parameter setting mode.
3. Turn the SET button until “CLR” appears.
   - Pr. 30 must be set to “1”.
   (For details, refer to steps 3 to 6 on page 18.)
4. Press the SET button to show “0”.
5. Turn the SET button to change it to “1”.
6. Press the SET button.

Flicker... Parameter setting complete!!

### CLR Setting

<table>
<thead>
<tr>
<th>CLR Setting</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Not executed</td>
</tr>
</tbody>
</table>
| 1           | Parameter clear \(^1\)
   (Calibration parameters C1 to C7 are not cleared.) |
| 10          | All clear \(^2\)
   (All set values including those of calibration parameters C1 to C7 are returned to factory settings.) |

\(^1\) Parameters are not cleared when “1” is set in Pr. 77 “parameter write disable selection”.

\(^2\) Pr. 75 “reset selection/PU stop selection”, Pr. 38, Pr. 39, Pr. 53, Pr. 62 to Pr. 65, Pr. 69, maintenance function parameters H1, H2, calibration parameters C1 to C7 and communication parameters n13, n15 are not cleared.

---

4.4 Clearing the parameters
## 4.5 Monitoring the output current

### POINT

The output current appears while the SET button is pressed in the monitor mode.

<table>
<thead>
<tr>
<th>Operation</th>
<th>Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Press the SET button to choose the output frequency monitor mode.</td>
<td>600</td>
</tr>
<tr>
<td>2. Independently of whether the inverter is running in any operation mode or at a stop, the output current appears while the SET button is pressed.</td>
<td>Hold down I0R (1.0A)</td>
</tr>
<tr>
<td>3. Release the SET button to return to the output frequency monitor mode.</td>
<td>600</td>
</tr>
</tbody>
</table>

### Remarks

When Pr. 52 = “1”, the output current is displayed in the monitor mode and the output frequency appears while the SET button is pressed.
4.6 Adjusting the current amount for frequency setting signal (example: performing operation at 30Hz)

**POINT**
- Assign the AU signal to any of the terminal RH, RM, RL, or STR and turn on the AU signal.
- Pr. 62 and Pr. 39 are extended function parameters. Set “1” in Pr. 30. (Refer to page 18.)
- Set “2” (external operation mode) in Pr. 79 “operation mode”

**REMARKS**
- Refer to page 30, 33 for other parameters’ setting.
- Refer to page 35 for details of Pr. 62 “RH terminal function selection”.

---

[Connection diagram]

3-phase AC power supply

Forward rotation start

Reverse rotation start

Current input selection

- AU signal (RH terminal)
- SD

Current output frequency setting device (4 to 20mA DC)

Motor

Earth (Ground)

Inverter

- R/L1
- S/L2
- T/L3

**[AU signal assignment]**
- Assign the AU signal to any of the RL, RM, RH or STR terminal.
  - (example) Assign the AU signal to the RH terminal.
  - Set “4” (AU signal) in Pr. 62 “RH terminal function selection”.

**Operation**

1. Confirm the RUN indication and operation mode indication.
   - The inverter must be at a stop.
   - The inverter must be in the PU operation mode (Press the set button).

2. Press the set button to choose the parameter setting mode.

3. Turn the set button until Pr. 62 (Pr. 62) appears.

4. Press the set button to read the currently set value.
   - “2” (factory setting) appears.

5. Turn the set button to change it to the set value of “4”.

6. Press the set button to set the value.

Display: Parameter setting complete!!
Adjusting the current amount for frequency setting signal (example: performing operation at 30Hz)

• Set "30Hz" in Pr. 39.

7. Turn the until Pr. 39 (Pr. 39) appears.

8. Press the to show the currently set value. (60Hz)

9. Turn the to change it to the set value of "30.0". (30Hz)

10. Press the to set the value.

Flicker—30Hz output at 20mA current input complete!!

11. Apply currents across terminals 4-5 of the inverter with a current output frequency setting potentiometer to turn on the start command (STF, STR).

REMARKS

• Set frequency at 4mA using calibration parameter C8 and adjust the indicator using calibration parameter C7. (Refer to page 41.)
5. ADJUSTMENT OF THE FREQUENCY SETTING POTENTIOMETER AND INDICATOR

Related parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Name</th>
<th>Setting Range</th>
<th>Factory Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>38</td>
<td>Frequency setting voltage frequency</td>
<td>1 to 120Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>39</td>
<td>Frequency setting current frequency</td>
<td>1 to 120Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>C2</td>
<td>Frequency setting voltage bias frequency</td>
<td>0 to 60Hz</td>
<td>0Hz</td>
</tr>
<tr>
<td>C3</td>
<td>Frequency setting voltage bias</td>
<td>0 to 300%</td>
<td>0%</td>
</tr>
<tr>
<td>C4</td>
<td>Frequency setting voltage gain</td>
<td>0 to 300%</td>
<td>96%</td>
</tr>
<tr>
<td>C5</td>
<td>Frequency setting current bias frequency</td>
<td>0 to 60Hz</td>
<td>0Hz</td>
</tr>
<tr>
<td>C6</td>
<td>Frequency setting current bias</td>
<td>0 to 300%</td>
<td>20%</td>
</tr>
<tr>
<td>C7</td>
<td>Frequency setting current gain</td>
<td>0 to 300%</td>
<td>100%</td>
</tr>
</tbody>
</table>

*Settings may differ because of calibration parameters.

**POINT**

- **Bias setting for 0 to 5VDC (0 to 10VDC) input**  
  Use the calibration parameter C2, C3 for setting.

- **Gain setting for 0 to 5VDC (0 to 10VDC) input**  
  Use Pr. 38, calibration parameter C4 for setting.

- **Bias setting for 4 to 20mA DC input**  
  Use the calibration parameter C5, C6 for setting.

- **Gain setting for 4 to 20mA DC input**  
  Use Pr. 39, calibration parameter C7 for setting.

For 4 to 20mA input, set “4” in any of Pr. 60 to Pr. 63 (input terminal function selection) and assign AU (current input selection) to any of terminals RH, RM, RL and STR, and turn on the AU signal.
Changing the output frequency setting of the frequency setting potentiometer (bias and gain of frequency setting voltage (current))

5.1 Changing the output frequency setting of the frequency setting potentiometer (bias and gain of frequency setting voltage (current))

Pr. 38, Pr. 39 and calibration parameters “C1 to C7” can be made to be read by setting “1” (extended function parameter valid) in Pr. 30 “extended function display selection”.

The bias/gain of the frequency setting voltage (current) may be adjusted in any of the following methods:

1. Changing the highest frequency
2. Adjusting the deviation of the highest frequency from the Pr. 38 (Pr. 39) setting
   - (2)-1: Make adjustment at any point with a voltage applied across terminals 2-5 (with a current flowing across terminals 4-5)
   - (2)-2: Make adjustment at any point without a voltage applied across terminals 2-5 (without a current flowing across terminals 4-5) (For the setting method, refer to the instruction manual (detailed).)
Changing the output frequency setting of the frequency setting potentiometer (bias and gain of frequency setting voltage (current))

**ADJUSTMENT OF THE FREQUENCY SETTING POTENTIOMETER AND INDICATOR**

(1) Changing the highest frequency

- **POINT**
  - Pr. 38 is an extended function parameter. Pr. 30 must be set to "1". (Refer to page 18.)
  - Change Pr. 38 "frequency setting voltage gain frequency" to 50Hz.

- **REMARKS**
  - To change the value to more than 60Hz, Pr. 1 "maximum frequency" must be set to more than 60Hz.

Changing example: When you want to use the 0 to 5VDC input frequency setting potentiometer to change the 5V-time frequency from 60Hz (factory setting) to 50Hz.

1. **Operation**
   - Confirm the RUN indication and operation mode indication.
   - The inverter must be at a stop.
   - The inverter must be in the PU operation mode. (Press the RUN button)

2. **Display**
   - Press the MODE button to choose the parameter setting mode.

3. **Operation**
   - Turn the until Pr. 38 "frequency setting voltage gain frequency" appears.
   - Pr. 30 must be set to "1" (Refer to steps 3 to 6 on page 18 for the parameter setting method.)

4. **Display**
   - Press the to display the currently set value. (60Hz)

5. **Operation**
   - Turn the to change it to "50.0" (50Hz)

6. **Display**
   - Press the to set the value.

   | Press the MODE button to show the next parameter.
   | Press the MODE button twice to show the next parameter.
   | Press the MODE button to read the next parameter.

7. **Operation**
   - The monitor/frequency setting indication cannot be changed to just 50Hz...Why?
     - The calibration parameter C4 "frequency setting voltage gain" value must be set. (Refer to page 28.)

The monitor/frequency setting indication cannot be changed to just 50Hz...Why?

| The calibration parameter C4 "frequency setting voltage gain" value must be set. (Refer to page 28.)
| Press the MODE button to show the setting again.
| Press the MODE button twice to show the next parameter.
| Press the MODE button to read the next parameter.

To change the value to more than 60Hz, Pr. 1 "maximum frequency" must be set to more than 60Hz.
Changing the output frequency setting of the frequency setting potentiometer (bias and gain of frequency setting voltage (current))

(2) Adjusting a deviation of the highest frequency from the Pr. 38 (Pr. 39) setting.

(2)-1) Making adjustment with a voltage applied directly across terminals 2-5 (with a current flowing across terminals 4-5)

Changing example Changing the calibration parameter C4 “frequency setting voltage gain”

POINT
The calibration parameter C4 is an extended function parameter. Pr. 30 must be set to “1”.

The frequency meter (indicator) connected to across terminals FM-SD does not indicate just 50Hz. Why?

Why? The calibration parameter C1 “FM terminal calibration” value must be set. (Refer to page 27)

When write is performed, an error (1) is displayed.

Why? The gain and bias frequency settings are too close.

Changing example Changing the calibration parameter C4 “frequency setting voltage gain”

POINT
The calibration parameter C4 is an extended function parameter. Pr. 30 must be set to “1”.

The frequency meter (indicator) connected to across terminals FM-SD does not indicate just 50Hz. Why?

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Changing example Changing the calibration parameter C4 “frequency setting voltage gain”

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Changing example Changing the calibration parameter C4 “frequency setting voltage gain”

POINT
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The frequency meter (indicator) connected to across terminals FM-SD does not indicate just 50Hz. Why?

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Changing example Changing the calibration parameter C4 “frequency setting voltage gain”

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The calibration parameter C4 is an extended function parameter. Pr. 30 must be set to “1”.

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When write is performed, an error (1) is displayed.

Why? The gain and bias frequency settings are too close.

Changing example Changing the calibration parameter C4 “frequency setting voltage gain”

POINT
The calibration parameter C4 is an extended function parameter. Pr. 30 must be set to “1”.

The frequency meter (indicator) connected to across terminals FM-SD does not indicate just 50Hz. Why?

Why? The calibration parameter C1 “FM terminal calibration” value must be set. (Refer to page 27)

When write is performed, an error (1) is displayed.

Why? The gain and bias frequency settings are too close.

Changing example Changing the calibration parameter C4 “frequency setting voltage gain”

POINT
The calibration parameter C4 is an extended function parameter. Pr. 30 must be set to “1”.

The frequency meter (indicator) connected to across terminals FM-SD does not indicate just 50Hz. Why?

Why? The calibration parameter C1 “FM terminal calibration” value must be set. (Refer to page 27)

When write is performed, an error (1) is displayed.

Why? The gain and bias frequency settings are too close.

Changing example Changing the calibration parameter C4 “frequency setting voltage gain”

POINT
The calibration parameter C4 is an extended function parameter. Pr. 30 must be set to “1”.

The frequency meter (indicator) connected to across terminals FM-SD does not indicate just 50Hz. Why?

Why? The calibration parameter C1 “FM terminal calibration” value must be set. (Refer to page 27)

When write is performed, an error (1) is displayed.

Why? The gain and bias frequency settings are too close.
5.2 Adjustment (calibration) of the frequency meter (indicator)

**Changing example**

Deflecting the meter (analog indicator) to full-scale (1mA) at the preset frequency of 60Hz.
(Refer to page 15 for frequency setting.)

**POINT**

- The calibration parameters "C1" can be made to be read by setting "1" (extended function parameter valid) in Pr. 30 "extended function display selection".
- Set the value of the calibration parameter C1 "FM terminal calibration".

**Operation**

1. Press the \( P \)  to choose the parameter setting mode.
2. Turn the \( O \)  to show "C" setting.
   - Pr. 30 must be set to "1".
   - (For details, refer to steps 3 to 6 on page 18.)
3. Press the \( P \)  to show \( C \)  until the calibration parameter C1 "FM terminal calibration" appears.
4. Press the \( M \)  to enable setting.
5. If the inverter is at a stop, press the \( W \)  to start the inverter.
   - (A motor need not be connected.)
6. Turn the \( A \)  to adjust the indicator needle to the desired position.
7. Press the \( S \)  twice to show the next parameter (C).
8. Press the \( L \)  to choose the parameter setting mode.
   - By turning the \( O \), you can read another parameter.
   - Press the \( P \)  to return to the "C" indication (step 3).
   - Press the \( M \)  twice to show the next parameter (C).

**Display**

- The parameter number read previously appears.

**POINT**

- By setting the Pr. 54 "FM terminal function selection" value, preset Pr. 55 "frequency monitoring reference" or Pr. 56 "current monitoring reference" to the running frequency or current value at which the output signal is 1440 pulses/s.
- At 1440 pulses/s, the meter generally deflects to full-scale.

**REMARKS**

- Depending on the set value, it may take some time for the needle to move.
- Setting "1" is set in Pr. 30 "extended function display selection". The calibration parameter C1 "FM terminal calibration" can also be set in the external operation mode.

Flicker...Parameter setting complete!!

Setting is complete.
### 6. FUNCTION LIST

#### 6.1 Basic function parameter list

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Name</th>
<th>Indication</th>
<th>Setting Range</th>
<th>Minimum Setting Increments</th>
<th>Factory Setting</th>
<th>Customer Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Torque boost</td>
<td>P 0</td>
<td>0 to 15%</td>
<td>0.1%</td>
<td>6%</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Maximum frequency</td>
<td>P 1</td>
<td>0 to 120Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Minimum frequency</td>
<td>P 2</td>
<td>0 to 120Hz</td>
<td>0.1Hz</td>
<td>0Hz</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Base frequency</td>
<td>P 3</td>
<td>0 to 120Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Multi-speed setting (high speed)</td>
<td>P 4</td>
<td>0 to 120Hz</td>
<td>0.1Hz</td>
<td>60Hz</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Multi-speed setting (middle speed)</td>
<td>P 5</td>
<td>0 to 120Hz</td>
<td>0.1Hz</td>
<td>30Hz</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Multi-speed setting (low speed)</td>
<td>P 6</td>
<td>0 to 120Hz</td>
<td>0.1Hz</td>
<td>10Hz</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Acceleration time</td>
<td>P 7</td>
<td>0 to 999s</td>
<td>0.1s</td>
<td>5s</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Deceleration time</td>
<td>P 8</td>
<td>0 to 999s</td>
<td>0.1s</td>
<td>5s</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Electronic thermal O/L relay</td>
<td>P 9</td>
<td>0 to 50A</td>
<td>0.1A</td>
<td>Rated output current</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Extended function display selection</td>
<td>P 30</td>
<td>0, 1</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>79</td>
<td>Operation mode selection</td>
<td>P 79</td>
<td>0 to 4, 7, 8</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

**Remarks**

- Setting “1” in Pr. 30 “extended function display selection” makes the extended function parameters valid. (Refer to page 18.)
- The decimal places of a value of 100 or more (3 digits or more) cannot be set to be displayed.
6.2 Explanation of the basic function parameters

For details, refer to the separately available instruction manual (detailed).

**Pr. 6 “torque boost”**
- Allows the motor torque in the low speed range to be adjusted according to the load. Make adjustment when stall prevention is operated when starting.
- When a constant-torque motor is used, set the following value:
  
<table>
<thead>
<tr>
<th>Voltage class</th>
<th>0.1K to 0.75K</th>
<th>1.5K to 3.7K</th>
</tr>
</thead>
<tbody>
<tr>
<td>Values in parenthesis are factory-set</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Pr. 1 “maximum frequency”, Pr. 2 “minimum frequency”**
- Clamps the upper and lower limits of the output frequency.

**Pr. 3 “base frequency”**
- Set the base frequency (reference frequency at rated motor torque) within the range 0 to 120Hz according to the motor.

**Pr. 7 “acceleration time”, Pr. 8 “deceleration time”**
- As the acceleration time, set the time taken to reach the acceleration/deceleration reference frequency in Pr. 20 from 0Hz (factory set to 60Hz), and as the deceleration time, set the time taken to reach 0Hz from the Pr. 20 value (factory set to 60Hz).

**Pr. 4 “multi-speed setting (high speed)”, Pr. 5 “multi-speed setting (middle speed)”, Pr. 6 “multi-speed setting (low speed)”**
- You can select any speed (RH, RM, RL) by simply switching the external contact signal.

- Each speed (frequency) can be set to any value within the range 0 to 120Hz if the inverter is running.
- The extended functions enable setting of up to 15 speeds.

**CAUTION**
The RL signal needs to be assigned with Pr. 60 and Pr. 63.
Explanation of the basic function parameters

**Pr. 30 "extended function display selection"**
- Set this parameter when showing/setting the extended function parameters.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Only basic functions are displayed.</td>
</tr>
<tr>
<td>1</td>
<td>All parameters are displayed.</td>
</tr>
</tbody>
</table>

**Pr. 9 "electronic thermal O/L relay"**
- You can set a current value for protection of the motor from overheating. Normally, set the rated motor current at 50Hz as it is.
- At the setting of 0A, motor protection does not function. (The output transistor protection of the inverter functions.)
- When connecting multiple motors to the inverter, provide external thermal relays to individual motors.
- For the 0.1K to 0.75K, this value is factory-set to 85% of the rated inverter current.
- Turn the RT signal on to select the second electronic thermal relay function. (Refer to page 40.)

**Pr. 79 "operation mode selection"**
- The inverter has two different operation modes: operation under control of external signals and operation from the PU (setting dial). You can use either or both operation modes.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>PU (setting dial) operation or external operation can be selected by the setting dial setting.</td>
</tr>
<tr>
<td>1</td>
<td>PU (setting dial) operation may be performed.</td>
</tr>
<tr>
<td>2</td>
<td>Only external operation may be performed.</td>
</tr>
<tr>
<td>3</td>
<td>Start signal&lt;br&gt;- Setting made by the setting dial&lt;br&gt;- Multi-speed selection&lt;br&gt;- 4 to 20mA (Made valid when the AU signal turns on)</td>
</tr>
<tr>
<td>4</td>
<td>Running frequency&lt;br&gt;Start signal&lt;br&gt;External terminal (STF/STR)</td>
</tr>
<tr>
<td>7</td>
<td>PU operation interlock&lt;br&gt;(Switching to the PU operation mode is enabled/disabled by turning the MRS signal ON/OFF)</td>
</tr>
<tr>
<td>8</td>
<td>Operation mode external signal switching (disabled during operation)&lt;br&gt;Turn the X16 signal ON/OFF to choose operation mode.</td>
</tr>
</tbody>
</table>
### 6.3 Extended function parameter list

Setting "1" in Pr. 30 "extended function display selection" makes the extended function parameters valid. (Refer to the separately available instruction manual (detailed).)

<table>
<thead>
<tr>
<th>Parameter indication</th>
<th>Name</th>
<th>Description</th>
<th>Factory Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 P.10</td>
<td>DC injection brake operation frequency</td>
<td>Set the timing of switching to DC injection brake (0 to 120Hz), the time to apply DC injection brake (0 to 10s), and the braking torque at DC injection brake start (0 to 15%). (Set Pr. 12 to 4% when a constant-torque motor is used.)</td>
<td>3Hz</td>
</tr>
<tr>
<td>11 P.11</td>
<td>DC injection brake operation time</td>
<td></td>
<td>0.5s</td>
</tr>
<tr>
<td>12 P.12</td>
<td>DC injection brake voltage</td>
<td>Frequency which is output by the inverter first at a start and gives great influence to the starting torque. About 1 to 3Hz for vertical lift applications, or up to 9Hz to the maximum. For other than vertical lift applications, factory setting of about 0.5Hz is recommended.</td>
<td>6%</td>
</tr>
<tr>
<td>13 P.13</td>
<td>Starting frequency</td>
<td>Frequency which is output by the inverter first at a start and gives great influence to the starting torque. About 1 to 3Hz for vertical lift applications, or up to 9Hz to the maximum. For other than vertical lift applications, factory setting of about 0.5Hz is recommended.</td>
<td>0.5Hz</td>
</tr>
<tr>
<td>14 P.14</td>
<td>Load pattern selection</td>
<td>Choose the output frequency and output voltage patterns according to the application (load characteristic).</td>
<td></td>
</tr>
<tr>
<td>15 P.15</td>
<td>Jog frequency</td>
<td>Speed command (0 to 120Hz) and acceleration/deceleration slope (0 to 999s) for jog (inching) operation When the FR-PU04 is connected, these parameters can be read as the basic parameters.</td>
<td>5Hz</td>
</tr>
<tr>
<td>16 P.16</td>
<td>Jog acceleration/deceleration time</td>
<td>For jog (inching) operation</td>
<td>0.5s</td>
</tr>
<tr>
<td>17 P.17</td>
<td>RUN key rotation direction selection</td>
<td>The turn of the operation panel can be used to choose the direction of rotation for operation.</td>
<td>0</td>
</tr>
<tr>
<td>18 P.18</td>
<td>Base frequency voltage</td>
<td>Indicates the magnitude of the output voltage at the base frequency (Pr.3) B88: 95% of power supply voltage - - : Same as power supply voltage 0 to 800V, B88, - - -</td>
<td>- - -</td>
</tr>
</tbody>
</table>
Extended function parameter list

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Name</th>
<th>Description</th>
<th>Factory Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 P20</td>
<td>Acceleration/deceleration base frequency</td>
<td>Indicates the frequency to be referenced for acceleration from or deceleration to 0Hz in the time set in Pr. 7 “acceleration time” or Pr. 8 “deceleration time”. 1 to 120Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>21 P21</td>
<td>Stall prevention function selection</td>
<td>Stall prevention is a function designed to suspend a frequency increase during acceleration, decrease frequency during constant speed or suspend a frequency decrease during deceleration if the preset current (0 to 200%) is exceeded, in order to prevent an overcurrent alarm. Pr. 21 allows you to select whether to use stall prevention or not according to the acceleration/deceleration status. Since the high response current limit value is 170%, torque will not be developed if Pr. 22 is set to more than 170%. In that case, set “1” in Pr. 21.</td>
<td>0</td>
</tr>
<tr>
<td>22 P22</td>
<td>Stall prevention operation level</td>
<td>Used to reduce the stall prevention level at or above the base frequency. Setting other than “- - -” specifies the current level at 120Hz which is lower than the Pr. 22 value of the stall prevention level at base frequency. 0 to 200%, - - -</td>
<td>150%</td>
</tr>
<tr>
<td>23 P23</td>
<td>Stall prevention operation level compensation factor at double speed</td>
<td>Used to reduce the stall prevention level at or above the base frequency. Setting other than “- - -” specifies the current level at 120Hz which is lower than the Pr. 22 value of the stall prevention level at base frequency. 0 to 200%, - - -</td>
<td>- - -</td>
</tr>
<tr>
<td>24 P24</td>
<td>Multi-speed setting (speed 4)</td>
<td>Setting other than “- - -” specifies speeds 4 to 7. By combining ON and OFF of the contact signals (RH, RM, RL signals), the running speed can be changed step-by-step.</td>
<td>- - -</td>
</tr>
<tr>
<td>25 P25</td>
<td>Multi-speed setting (speed 5)</td>
<td>Setting other than “- - -” specifies speeds 4 to 7. By combining ON and OFF of the contact signals (RH, RM, RL signals), the running speed can be changed step-by-step.</td>
<td>- - -</td>
</tr>
<tr>
<td>26 P26</td>
<td>Multi-speed setting (speed 6)</td>
<td>Setting other than “- - -” specifies speeds 4 to 7. By combining ON and OFF of the contact signals (RH, RM, RL signals), the running speed can be changed step-by-step.</td>
<td>- - -</td>
</tr>
<tr>
<td>27 P27</td>
<td>Multi-speed setting (speed 7)</td>
<td>Setting other than “- - -” specifies speeds 4 to 7. By combining ON and OFF of the contact signals (RH, RM, RL signals), the running speed can be changed step-by-step.</td>
<td>- - -</td>
</tr>
<tr>
<td>28 P28</td>
<td>Stall prevention operation reduction starting frequency</td>
<td>You can reduce the stall prevention level at high frequency range. 0 to 120Hz</td>
<td>60Hz</td>
</tr>
<tr>
<td>29 P29</td>
<td>Acceleration/deceleration pattern</td>
<td>Determines the frequency changing pattern for acceleration/deceleration. 0: Linear acceleration/deceleration 1: S-pattern acceleration/deceleration A (e.g. machine tool spindle applications) 2: S-pattern acceleration/deceleration B (for prevention of load shifting in conveyor and other applications.)</td>
<td>0</td>
</tr>
</tbody>
</table>

For parameter 30, refer to the basic function parameters.
Set the frequency range you want to evade during constant-speed operation to avoid resonance with a machine.

- **Parameter 33**: Frequency jump 2A
- **Parameter 34**: Frequency jump 2B
- **Parameter 35**: Frequency jump 3A
- **Parameter 36**: Frequency jump 3B

**Parameter 37**: Speed display
- You can convert the frequency monitor/set frequency of the operation panel into the load speed and display it. Setting 0 shows the output frequency, and setting 0.1 to 999 shows the load speed. (Set the speed for 60Hz operation.)
- **Factory Setting**: 0

**Parameter 38**: Frequency setting voltage gain frequency
- You can set as desired the magnitude (slope) of the output frequency to the external frequency setting voltage signal (0 to 5V or 0 to 10V).
- **Factory Setting**: 60Hz

**Parameter 39**: Frequency setting current gain frequency
- You can set as desired the magnitude (slope) of the output frequency to the external frequency setting current signal (4 to 20mA).
- **Factory Setting**: 60Hz

**Parameter 40**: Start-time earth (ground) fault detection selection
- Set whether an earth (ground) fault is to be detected or not at a start.
- **Factory Setting**: 0

**Parameter 41**: Up-to-frequency sensitivity
- You can adjust the ON range of the up-to-frequency signal (SU) to be output when the output frequency reaches the running frequency. You can use this function to ensure that the running frequency has been reached or use it as the operation start signal etc. for related equipment.
- **Factory Setting**: 10%

**Parameter 42**: Output frequency detection
- Set the reference value at which the signal (FU) is output when the output frequency rises to or above a certain value. This function can be used for electromagnetic brake operation, open signal, etc.
- **Factory Setting**: 6Hz
### Extended function parameter list

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Name</th>
<th>Description</th>
<th>Factory Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>P#3</td>
<td>Output frequency detection for reverse operation</td>
<td>Set the reference value at which the signal (FU) is output when the output frequency rises to or above a certain value. This function is valid for reverse operation. 0 to 120Hz, - - -</td>
<td>- - -</td>
</tr>
<tr>
<td>P#4</td>
<td>Second acceleration/deceleration time</td>
<td>Second function of the acceleration/deceleration time set in Pr. 7, Pr. 8. 0 to 999s</td>
<td>5s</td>
</tr>
<tr>
<td>P#5</td>
<td>Second deceleration time</td>
<td>Second function for the deceleration time set in Pr. 8. 0 to 999s, - - -</td>
<td>- - -</td>
</tr>
<tr>
<td>P#6</td>
<td>Second torque boost</td>
<td>Second function for the torque boost set in Pr. 0. 0 to 15%, - - -</td>
<td>- - -</td>
</tr>
<tr>
<td>P#7</td>
<td>Second V/F (base frequency)</td>
<td>Second function for the base frequency set in Pr. 3. 0 to 120Hz, - - -</td>
<td>- - -</td>
</tr>
<tr>
<td>P#8</td>
<td>Output current detection level</td>
<td>Set the level at which the output current detection signal (Y12) is output. 0 to 200%</td>
<td>150%</td>
</tr>
<tr>
<td>P#9</td>
<td>Output current detection signal delay time</td>
<td>When the output current is at or above the output current detection level (Pr. 48) for longer than the period (Pr. 49), the output current detection signal (Y12) is output. 0 to 10s</td>
<td>0s</td>
</tr>
<tr>
<td>P#10</td>
<td>Zero current detection level</td>
<td>Set the level at which the zero current detection signal (Y13) is output. 0 to 200%</td>
<td>5%</td>
</tr>
<tr>
<td>P#11</td>
<td>Zero current detection period</td>
<td>When the output current is at or below the zero current detection level (Pr. 50) for longer than the period (Pr. 51), the zero current detection signal (Y13) is output. 0.05 to 1s</td>
<td>0.5s</td>
</tr>
<tr>
<td>P#12</td>
<td>Operation panel display data selection</td>
<td>You can choose the data displayed on the operation panel. 0: Output frequency 1: Output current 2: Set frequency during stop/output frequency during operation</td>
<td>0</td>
</tr>
<tr>
<td>P#13</td>
<td>Frequency setting operation selection</td>
<td>You can use the setting dial like a potentiometer to perform operation. 0: Setting dial frequency setting mode 1: Setting dial frequency setting mode</td>
<td>0</td>
</tr>
<tr>
<td>P#14</td>
<td>FM terminal function selection</td>
<td>You can choose the indicator connected to the FM terminal. 0: Output frequency monitor 1: Output current monitor</td>
<td>0</td>
</tr>
</tbody>
</table>
### Extended function parameter list

<table>
<thead>
<tr>
<th>Parameter Indication</th>
<th>Name</th>
<th>Description</th>
<th>Factory Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>55</td>
<td>P5S</td>
<td>Frequency monitoring reference</td>
<td>Set the reference value of frequency monitoring: 0 to 120Hz</td>
</tr>
<tr>
<td>56</td>
<td>P5E</td>
<td>Current monitoring reference</td>
<td>Set the reference value of current monitoring: 0 to 50A</td>
</tr>
<tr>
<td>57</td>
<td>P57</td>
<td>Restart coasting time</td>
<td>At power restoration after an instantaneous power failure, you can restart the inverter without motor being stopped (with motor coasting). The inverter begins to restart after this period (Pr. 57) has elapsed after power restoration. When you set &quot;---&quot;, a restart is not made. &quot;C&quot; setting generally does not pose a problem but you can adjust the time (0 to 5s, &quot;---&quot;) according to the magnitude of the load. When the restart coasting time (Pr. 57) has elapsed, the output voltage is risen gradually. Set this cushion time (0 to 60s). Operation may be performed generally at the factory setting, but you can adjust the time according to the magnitude of the load. Refer to additional parameter H6 for selection of frequency search. (Refer to page 40.)</td>
</tr>
<tr>
<td>58</td>
<td>P58</td>
<td>Restart cushion time</td>
<td>1s</td>
</tr>
<tr>
<td>59</td>
<td>P59</td>
<td>Remote setting function selection</td>
<td>You can set the remote setting function which is used when the operation panel is away from the control box, for example. 0: Without remote setting function, 1: With remote setting function</td>
</tr>
<tr>
<td>60</td>
<td>P60</td>
<td>RL terminal function selection</td>
<td>You can choose the following input signals: 0: RL (multiple low-speed operation command), 1: RM (multiple middle-speed operation command), 2: RH (multiple high-speed operation command), 3: RT (second function selection), 4: AU (current input selection), 5: STOP (start self-holding selection), 6: MRS (output stop), 7: OH (external thermal relay input), 8: REX (15 multi-speed selection), 9: JOG (jog operation selection), 10: RES (reset), 14: X14 (PID control valid terminal), 16: X16 (PU operation/external operation switching), 17: STR (reverse rotation start (may be assigned to only STR terminal))</td>
</tr>
<tr>
<td>61</td>
<td>P61</td>
<td>RM terminal function selection</td>
<td>1</td>
</tr>
<tr>
<td>62</td>
<td>P62</td>
<td>RH terminal function selection</td>
<td>2</td>
</tr>
<tr>
<td>63</td>
<td>P63</td>
<td>STR terminal function selection</td>
<td>- - -</td>
</tr>
</tbody>
</table>
### Extended function parameter list

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Name</th>
<th>Description</th>
<th>Factory Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>64</td>
<td>P64</td>
<td>RUN terminal function selection</td>
<td>You can choose the following output signals: 0: RUN (inverter running) 1: SU (up-to-frequency) 2: OL (overload warning) 3: FU (output frequency detection) 4: RY (operation ready) 5: Y12 (output current detection) 6: Y13 (zero current detection) 7: FDN (PID lower limit signal) 8: FUP (PID upper limit signal) 9: RL (PID forward/reverse rotation signal) 10: Y93 (current average value monitor signal [can be assigned to the RUN terminal only]) 11: Y95 (maintenance timer alarm) 12: LF (minor failure output) 13: ABC (alarm output)</td>
</tr>
<tr>
<td>65</td>
<td>P65</td>
<td>A, B, C terminal function selection</td>
<td></td>
</tr>
<tr>
<td>66</td>
<td>P66</td>
<td>Retry selection</td>
<td>You can choose the retry alarm to be activated when the protective function is activated: 0: OC1 to 3, OV1 to 3, THM, THT, BE, GF, OHT, OLT, PE, OPT 1: OC1 to 3, 2: OV1 to 3, 3: OC1 to 3, OV1 to 3</td>
</tr>
<tr>
<td>67</td>
<td>P67</td>
<td>Number of retries at alarm occurrence</td>
<td>You can set the number of retries to be made when the protective function is activated: 0: No retry 1 to 10: Without alarm output during retry operation 101 to 110: With alarm output during retry operation</td>
</tr>
<tr>
<td>68</td>
<td>P68</td>
<td>Retry waiting time</td>
<td>You can set the waiting time from when the protective function is activated until a retry is made. 0.1 to 360s</td>
</tr>
<tr>
<td>69</td>
<td>P69</td>
<td>Retry count display erase</td>
<td>You can display the cumulative number of successful restarts made by retries when the protective function is activated. 0: Cumulative count erase</td>
</tr>
<tr>
<td>70</td>
<td>P70</td>
<td>Soft-PWM setting</td>
<td>You can select whether to employ Soft-PWM control and long wiring mode. When Soft-PWM is valid, you can change the metallic motor tone into an unoffending complex tone. 0: Soft-PWM invalid, 1: Soft-PWM valid</td>
</tr>
<tr>
<td>Parameter</td>
<td>Name</td>
<td>Description</td>
<td>Factory Setting</td>
</tr>
<tr>
<td>-----------</td>
<td>------</td>
<td>-------------</td>
<td>----------------</td>
</tr>
<tr>
<td>71  p31</td>
<td>Applied motor</td>
<td>Set the motor to be used: 0.100: Thermal characteristic for Mitsubishi standard motor 1.101: Thermal characteristic for Mitsubishi constant-torque motor When &quot;100 or 101&quot; is set, turning on the RT signal set the electronic thermal relay function to the thermal characteristic for the constant-torque motor.</td>
<td>0</td>
</tr>
<tr>
<td>72  p32</td>
<td>PWM frequency selection</td>
<td>You can change the PWM carrier frequency. Increasing this value reduces the motor audible noise, but increases noise and leakage current. The setting is in [kHz]. 0: 0.7kHz, 15: 14.5kHz 5 to 15 (Remarks) Metallic sound may be generated from the motor at sudden deceleration but it is not a fault.</td>
<td>1</td>
</tr>
<tr>
<td>73  p33</td>
<td>0-5V/10V selection</td>
<td>You can set the input voltage specification of terminal &quot;2&quot;. 0: For 0 to 5VDC input, 1: For 0 to 10VDC input</td>
<td>0</td>
</tr>
<tr>
<td>74  p34</td>
<td>Input filter time constant</td>
<td>Valid for eliminating noise of the frequency setting circuit. A larger set value increases the time constant. 0 to 8</td>
<td>1</td>
</tr>
<tr>
<td>75  p35</td>
<td>Reset selection/PU stop selection</td>
<td>You can choose the function of the stop button on the operation panel.</td>
<td>14</td>
</tr>
<tr>
<td>76  p36</td>
<td>Cooling fan operation selection</td>
<td>You can control the operation of the cooling fan built in the inverter. (Operates in power-on status.) 0: The fan normally operates at power on of the inverter. 1: The fan is normally on during inverter operation. The fan switches on/off according to the temperature during a stop of the inverter whose status is monitored.</td>
<td>1</td>
</tr>
</tbody>
</table>
Extended function parameter list

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Name</th>
<th>Description</th>
<th>Factory Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>77</td>
<td>Parameter write disable selection</td>
<td>You can choose whether to enable or disable parameter write.</td>
<td>0</td>
</tr>
<tr>
<td>78</td>
<td>Reverse rotation prevention selection</td>
<td>You can prevent trouble during reverse operation due to false input of the start signal.</td>
<td>0</td>
</tr>
<tr>
<td>80</td>
<td>Multi-speed setting (speed 8)</td>
<td>Setting other than &quot;- - -&quot; specifies speeds 8 to 15.</td>
<td>- - -</td>
</tr>
<tr>
<td>81</td>
<td>Multi-speed setting (speed 9)</td>
<td>By combining ON and OFF of the contact signals (RH, RM, RL, REX signals), the running speed can be changed step-by-step.</td>
<td>- - -</td>
</tr>
<tr>
<td>82</td>
<td>Multi-speed setting (speed 10)</td>
<td>Use Pr. 63 to assign the REX signal.</td>
<td>- - -</td>
</tr>
<tr>
<td>83</td>
<td>Multi-speed setting (speed 11)</td>
<td>Speed 8 OFF OFF OFF ON</td>
<td>- - -</td>
</tr>
<tr>
<td>84</td>
<td>Multi-speed setting (speed 12)</td>
<td>Speed 9 OFF OFF ON</td>
<td>- - -</td>
</tr>
<tr>
<td>85</td>
<td>Multi-speed setting (speed 13)</td>
<td>Speed 10 OFF ON OFF</td>
<td>- - -</td>
</tr>
<tr>
<td>86</td>
<td>Multi-speed setting (speed 14)</td>
<td>Speed 11 OFF ON ON</td>
<td>- - -</td>
</tr>
<tr>
<td>87</td>
<td>Multi-speed setting (speed 15)</td>
<td>Speed 12 OFF ON ON</td>
<td>- - -</td>
</tr>
<tr>
<td>88</td>
<td>PID action selection</td>
<td>Used to choose the operation of PID control.</td>
<td>20</td>
</tr>
<tr>
<td>89</td>
<td>PID proportional band control</td>
<td>Used to set the proportional band for PID control.</td>
<td>100%</td>
</tr>
<tr>
<td>90</td>
<td>PID integral time</td>
<td>Used to set the integral time for PID control.</td>
<td>15</td>
</tr>
<tr>
<td>91</td>
<td>PID upper limit</td>
<td>Used to set the upper limit value for PID control.</td>
<td>- - -</td>
</tr>
<tr>
<td>92</td>
<td>PID lower limit</td>
<td>Used to set the lower limit value for PID control.</td>
<td>- - -</td>
</tr>
<tr>
<td>93</td>
<td>PID action set point for PU operation</td>
<td>Used to set the PID action set point for PU operation.</td>
<td>0%</td>
</tr>
<tr>
<td>94</td>
<td>PID differential time</td>
<td>Used to set the differential time for PID control.</td>
<td>- - -</td>
</tr>
</tbody>
</table>
### Extended function parameter list

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Name</th>
<th>Description</th>
<th>Factory Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>95</td>
<td>P95 Rated motor slip</td>
<td>Used to set the rated motor slip to make slip compensation. 0 to 500% - - -</td>
<td>- - -</td>
</tr>
<tr>
<td>96</td>
<td>P96 Slip compensation time constant</td>
<td>Used to set the response time of slip compensation. 0.01 to 10s</td>
<td>0.5s</td>
</tr>
<tr>
<td>97</td>
<td>P97 Constant-output region slip compensation selection</td>
<td>Used to choose whether slip compensation is made or not in the constant-output region. 0, - - -</td>
<td>- - -</td>
</tr>
<tr>
<td>98</td>
<td>P98 Automatic torque boost selection (Motor capacity)</td>
<td>You can set the motor capacity and exercise automatic torque boost control. When you set - - -, V/F control is exercised. Set the motor capacity used. The motor capacity should be equal to or one rank lower than the inverter capacity. The number of motor poles should be 2, 4 or 6. (Only 4 poles for constant-torque motor) Single-motor operation (one motor run by one inverter) should be performed. Wiring length from inverter to motor should be within 30m. When using a constant-torque motor, set &quot;1&quot; in Pr. 71. Example: For 1.5kW, set &quot;1.5&quot;. 0.1 to 3.7kW, - - -</td>
<td>- - -</td>
</tr>
<tr>
<td>99</td>
<td>P99 Motor primary resistance</td>
<td>You can set the motor’s primary resistance value. Normally, this parameter need not be set. 0 to 500Ω, - - -</td>
<td>- - -</td>
</tr>
</tbody>
</table>

#### Maintenance parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Name</th>
<th>Description</th>
<th>Factory Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>H 1 Maintenance timer</td>
<td>Display the maintenance timer (cumulative energization time) in 100th increments. Parameter write is not enabled. 0 to 999</td>
<td>0</td>
</tr>
<tr>
<td>H2</td>
<td>H 2 Maintenance timer alarm output set time</td>
<td>When the maintenance timer has elapsed the time set in H2, the Y9S signal is output. Assign the Y9S signal with Pr. 64 or Pr. 65. 0 to 999, - - -</td>
<td>36 (36000h)</td>
</tr>
</tbody>
</table>
Extended function parameter list

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Name</th>
<th>Description</th>
<th>Factory Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>H3</td>
<td>Current average time</td>
<td>The average value of the output current during constant speed operation and the maintenance timer value are output to the current average value monitor signal (Y93).</td>
<td>1s</td>
</tr>
<tr>
<td>H4</td>
<td>Data output mask time</td>
<td>Y93 signal is output for 20s as 1 cycle in order of start bit for 1s (Hi), output current average value for 0.5 to 9s (Low), maintenance timer value for 2 to 9s (Hi), and end signal (Low).</td>
<td>0s</td>
</tr>
<tr>
<td>H5</td>
<td>Current average value monitor signal output reference current</td>
<td>Assign the Y93 signal to the RUN terminal using Pr. 64.</td>
<td>1A</td>
</tr>
</tbody>
</table>

Additional parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Name</th>
<th>Description</th>
<th>Factory Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>H6</td>
<td>Automatic restart after instantaneous power failure setting</td>
<td>System to detect the motor speed at the time of restart after instantaneous power failure. You can select whether to use (speed search system) or not.</td>
<td>1</td>
</tr>
<tr>
<td>H7</td>
<td>Second electronic thermal relay function</td>
<td>Protect the second motor from overheating. Made valid when the RT signal turns on. Refer to Pr. 9 for its function.</td>
<td>- -</td>
</tr>
</tbody>
</table>

Brake parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Name</th>
<th>Description</th>
<th>Factory Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>b1</td>
<td>Regenerative function selection</td>
<td>Set when using the optional dedicated brake resistor. 0: Brake resistor (MRS type), brake unit (BU type) (1.5K or more) 1: High-duty brake resistor (FR-ABR)</td>
<td>0</td>
</tr>
<tr>
<td>b2</td>
<td>Special regenerative brake duty</td>
<td>Set when using the optional high-duty brake resistor (FR-ABR). Setting can be made when b1=1. Set 10% in Pr. 561 when using the FR-ABR. 0 to 30%</td>
<td>0%</td>
</tr>
</tbody>
</table>
### Extended function parameter list

#### Calibration parameter

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Name</th>
<th>Description</th>
<th>Factory Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>C1</td>
<td>FM terminal calibration</td>
<td>—</td>
</tr>
<tr>
<td>C2</td>
<td>C2</td>
<td>Frequency setting voltage bias frequency</td>
<td>0Hz</td>
</tr>
<tr>
<td>C3</td>
<td>C3</td>
<td>Frequency setting voltage bias</td>
<td>0%*</td>
</tr>
<tr>
<td>C4</td>
<td>C4</td>
<td>Frequency setting voltage gain</td>
<td>96%*</td>
</tr>
<tr>
<td>C5</td>
<td>C5</td>
<td>Frequency setting current bias frequency</td>
<td>0Hz</td>
</tr>
<tr>
<td>C6</td>
<td>C6</td>
<td>Frequency setting current bias</td>
<td>20%*</td>
</tr>
<tr>
<td>C7</td>
<td>C7</td>
<td>Frequency setting current gain</td>
<td>100%*</td>
</tr>
<tr>
<td>C8</td>
<td>C8</td>
<td>Parameter for manufacturer setting. Do not set.</td>
<td>—</td>
</tr>
</tbody>
</table>

#### Parameter clear

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Factory Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLR</td>
<td>Parameter clear</td>
<td>—</td>
</tr>
<tr>
<td>ECL</td>
<td>Alarm history clear</td>
<td>—</td>
</tr>
</tbody>
</table>

*Settings may differ because of calibration parameters.*
Extended function parameter list

Communication parameters

To make RS-485 communication between the inverter and personal computer, the operation mode must be set to the "computer link operation mode". Pr. 79 "operation mode selection" = "1, 3, 4" and communication parameter n10 "link startup mode selection" = "1".

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Name</th>
<th>Description</th>
<th>Factory Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>n1</td>
<td>Communication station number*</td>
<td>Set the station number for communication from the RS-485 connector. 0 to 31. Specify the station number of the inverter.</td>
<td>0</td>
</tr>
<tr>
<td>n2</td>
<td>Communication speed*</td>
<td>48: 4800bps 96: 9600bps 192: 19200bps</td>
<td>192</td>
</tr>
<tr>
<td>n3</td>
<td>Stop bit length*</td>
<td>0: Stop bit length 1 bit/data length 8 1: Stop bit length 2 bits/data length 8 10: Stop bit length 1 bit/data length 7 11: Stop bit length 2 bits/data length 7</td>
<td>1</td>
</tr>
<tr>
<td>n4</td>
<td>Parity check presence/absence</td>
<td>0: No parity check 1: With odd parity check 2: With even parity check</td>
<td>2</td>
</tr>
<tr>
<td>n5</td>
<td>Number of communication retries</td>
<td>Set the permissible number of retries at occurrence of a data receive error. When you set &quot;- - -&quot;, the inverter will not come to an alarm stop if a communication error occurs. 0 to 10, - - -</td>
<td>1</td>
</tr>
<tr>
<td>n6</td>
<td>Communication check time interval</td>
<td>Set the interval of communication check time. If a no-communication status persists for longer than the permissible time, the inverter will come to an alarm stop. 0: No communication 0.1 to 999s - - : Check suspended To make communication, set any value other than 0 in the communication parameter n6 &quot;communication check time interval&quot;.</td>
<td>0s</td>
</tr>
<tr>
<td>n7</td>
<td>Waiting time setting*</td>
<td>Set the waiting time from when data is transmitted to the inverter until response is made. 0 to 150ms - - : Set in communication data</td>
<td>- -</td>
</tr>
<tr>
<td>n8</td>
<td>Operation command source</td>
<td>You can choose whether the operation command is given by the computer or external terminal. 0: Command source is computer 1: Command source is external terminal</td>
<td>0</td>
</tr>
<tr>
<td>n9</td>
<td>Speed command source</td>
<td>You can choose whether the speed command is given by the computer or external terminal. 0: Command source is computer 1: Command source is external terminal</td>
<td>0</td>
</tr>
</tbody>
</table>
### Extended function parameter list

**Parameter** | **Description** | **Factory Setting**
--- | --- | ---
**Parameter Name Outline Factory Setting**

**Parameter Name**

- **n10**: Link startup mode selection
  - You can choose the operation mode at power on or at power restoration after instantaneous power failure. Set "1" to select the computer link operation mode.
  - Mode set in Pr. 79 is established:
    - 0: Started in computer link mode.

- **n11**: CRLF selection
  - 0: Without CRLF
    - 1: With CR, without LF
    - 2: With CRLF

- **n12**: PROM write selection
  - 0: Write to RAM and PROM
    - 1: Write to RAM only
      - When a reset is performed, the parameter value will be the value of PROM.

- **n13**: PU display language selection
  - 0: Japanese, 1: English, 2: German
    - 3: French, 4: Spanish, 5: Italian
    - 6: Swedish, 7: Finish

- **n14**: PU buzzer control
  - 0: Without sound, 1: With sound

- **n15**: PU contrast adjustment
  - 0 (Light)
    - 63 (Dark)

- **n16**: PU main display screen data selection
  - 0: Selectable between output frequency and output current
    - 1: Set frequency (during stop)
    - 2: Output frequency (during operation)

- **n17**: Disconnected PU detection/PU setting lock
  - 0: Without PU disconnection error/PU operation valid
    - 1: Error at PU disconnection/PU operation valid
    - 10: Without PU disconnection error/PU operation invalid

**REMARKS**

- Parameters for the PU
  - When the parameter unit (FR-PU04) is used, operation from the operation panel is not accepted (is valid)

- **Parameter Name**
  - **n13**: PU display language selection
    - 0: Japanese, 1: English, 2: German
    - 3: French, 4: Spanish, 5: Italian
    - 6: Swedish, 7: Finish

- **n14**: PU buzzer control
  - 0: Without sound, 1: With sound

- **n15**: PU contrast adjustment
  - 0 (Light)
    - 63 (Dark)

- **n16**: PU main display screen data selection
  - 0: Selectable between output frequency and output current
    - 1: Set frequency (during stop)
    - 2: Output frequency (during operation)

- **n17**: Disconnected PU detection/PU setting lock
  - 0: Without PU disconnection error/PU operation valid
    - 1: Error at PU disconnection/PU operation valid
    - 10: Without PU disconnection error/PU operation invalid

---

*The parameter numbers within parentheses are those for use of the parameter unit (FR-PU04).
*Set "9999" when setting a value "- - -" using the parameter unit (FR-PU04).
*Pr. stands for a parameter number.
7. ERRORS AND PROTECTIVE FUNCTIONS

7.1 About errors (definitions)

When an alarm occurs in the inverter, the protective function is activated to bring the inverter to an alarm stop and the PU display automatically changes to any of the following error (alarm) indications. For details, refer to the separately available instruction manual (detailed).

<table>
<thead>
<tr>
<th>Operation Panel Indication</th>
<th>Function Name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>OC1</td>
<td>Overcurrent shut-off during acceleration</td>
<td>The inverter output current rose to or above about 200% of the rated inverter current during acceleration.</td>
</tr>
<tr>
<td>OC2</td>
<td>Overcurrent shut-off during constant speed</td>
<td>The inverter output current rose to or above about 200% of the rated inverter current during constant speed operation.</td>
</tr>
<tr>
<td>OC3</td>
<td>Overcurrent shut-off during deceleration</td>
<td>The inverter output current rose to or above about 200% of the rated inverter current during deceleration.</td>
</tr>
<tr>
<td>OV1</td>
<td>Regenerative overvoltage shut-off during acceleration</td>
<td>Excessive regenerative energy or surge voltage occurred during acceleration.</td>
</tr>
<tr>
<td>OV2</td>
<td>Regenerative overvoltage shut-off during constant speed</td>
<td>Excessive regenerative energy or surge voltage occurred during constant speed.</td>
</tr>
<tr>
<td>OV3</td>
<td>Regenerative overvoltage shut-off during deceleration or stop</td>
<td>Excessive regenerative energy or surge voltage occurred during deceleration or stop.</td>
</tr>
<tr>
<td>THM</td>
<td>Motor overload shut-off (Electronic thermal relay function) (*1)</td>
<td>Overload or reduced cooling capability during low-speed operation. Protection against burnout due to motor temperature rise.</td>
</tr>
<tr>
<td>THT</td>
<td>Inverter overload shut-off (Electronic thermal relay function) (*1)</td>
<td>Current more than 150% of the rated output current flow and overcurrent shut-off did not occur. Output transistor protection from overheat.</td>
</tr>
<tr>
<td>FIN</td>
<td>Fin overheat</td>
<td>Temperature rise of the heatsink.</td>
</tr>
<tr>
<td>GF</td>
<td>Start-time output side earth (ground) fault overcurrent protection (*2)</td>
<td>Earth (Ground) fault occurred on the inverter's output side at a start.</td>
</tr>
</tbody>
</table>

*1. Resetting the inverter initializes the internal thermal integration data of the electronic thermal relay function. 
*2. Activated only when “1” is set in Pr. 40 “start-time earth (ground) fault detection selection”.

(Set)
### About errors (definitions)

<table>
<thead>
<tr>
<th>Operation Panel Indication</th>
<th>Function Name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OH</strong> (OHT)</td>
<td>External thermal relay (*3)</td>
<td>External thermal relay provided for protection from overheat was actuated (contact open).</td>
</tr>
<tr>
<td><strong>OL</strong> (OLT)</td>
<td>Stall prevention (overload)</td>
<td>Stall prevention was activated to drop the running frequency to 0. (OL appears while stall prevention is activated.)</td>
</tr>
<tr>
<td><strong>bE</strong> (BE)</td>
<td>Brake transistor alarm</td>
<td>Error occurred in the brake circuit, e.g. damaged brake transistors.</td>
</tr>
</tbody>
</table>
| **OP** (OPT)               | Communication error | - Communication errors occurred consecutively more than the permissible number of retries when the RS-485 connector is used and communication parameter n6 ≠ “- - -”.
- RS-485 communication error occurred.
- Communication has broken for a period set in communication parameter n6. |
| **PE** (PE)                | Parameter storage device alarm | Error occurred in the parameter stored. |
| **PUE** (PUE)              | PU disconnected | PU was disconnected when communication parameter n17 = “1”. |
| **RET** (RET)              | Retry count excess | Operation could not be resumed properly within the preset number of retries. |
| **CPU** (CPU)              | CPU error | Arithmetic operation of the built-in CPU does not end within the predetermined time. |

### Minor failures

<table>
<thead>
<tr>
<th>Operation Panel Indication</th>
<th>Function Name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>F</strong> (FN)</td>
<td>Fan trouble</td>
<td>The cooling fan built in the inverter failed (stopped).</td>
</tr>
</tbody>
</table>

### Warnings

<table>
<thead>
<tr>
<th>Operation Panel Indication</th>
<th>Function Name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OL</strong> (OL)</td>
<td>Stall prevention (overcurrent) (*4)</td>
<td>Current more than 150% of the rated inverter current flowed in the motor and operation is being performed to prevent the inverter from resulting in overcurrent shut-off.</td>
</tr>
<tr>
<td><strong>OL</strong> (OL)</td>
<td>Stall prevention (overvoltage)</td>
<td>Regenerative energy of the motor became excessive and operation is being performed to stop the frequency from decreasing to prevent overvoltage shut-off.</td>
</tr>
<tr>
<td><strong>PU</strong> (PS)</td>
<td>PU stop</td>
<td>Pr. 75 “reset selection/PU stop selection” had been set and a stop was made by pressing stop button of the operation panel or parameter unit (FR-PU04).</td>
</tr>
<tr>
<td><strong>UV</strong> (UV)</td>
<td>Undervoltage</td>
<td>Power supply voltage of the inverter dropped.</td>
</tr>
</tbody>
</table>

---

*4. The stall prevention operation current may be set to any value. It is factory set to 150%. *
### About errors (definitions)

#### (4) Write errors

<table>
<thead>
<tr>
<th>Operation Panel Indication</th>
<th>Function Name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>During reset</td>
<td>During inverter reset (RES signal is ON)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Operation Panel Indication</th>
<th>Function Name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Write disable error</td>
<td>Write was performed with &quot;1&quot; set in Pr. 77</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Frequency jump setting range overlapped</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Parameter write was performed though the operation panel does not have the write precedence</td>
<td></td>
</tr>
<tr>
<td>Write-while-running error/mode designation error</td>
<td>Write was performed during operation:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>An attempt was made to change the Pr. 79 setting to the operation mode where the operation command has been input.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Write was performed in the external operation mode.</td>
<td></td>
</tr>
<tr>
<td>Calibration error</td>
<td>Analog input bias and gain calibration values are too close.</td>
<td></td>
</tr>
</tbody>
</table>
7.2 **To know the operating status at the occurrence of alarm**
(only when FR-PU04 is used)

When any alarm has occurred, the display automatically switches to the indication of the corresponding protective function (error). By pressing the \( \text{STOP} \) at this point without resetting the inverter, the display shows the output frequency, in \\( \text{ms} \) way, it is possible to know the running frequency at the occurrence of the alarm. It is also possible to know the current in the same manner. After resetting, you can confirm the definitions in "Alarm History". (For details, refer to the instruction manual of the parameter unit (FR-PU04.).)

7.3 **Correspondence between digital and actual characters**

There are the following correspondences between the actual alphanumeric characters and the digital characters displayed on the operation panel:

<table>
<thead>
<tr>
<th>Actual</th>
<th>Display</th>
<th>Actual</th>
<th>Display</th>
<th>Actual</th>
<th>Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>A</td>
<td>1</td>
<td>B</td>
<td>2</td>
<td>C</td>
</tr>
<tr>
<td>3</td>
<td>D</td>
<td>4</td>
<td>E</td>
<td>5</td>
<td>F</td>
</tr>
<tr>
<td>6</td>
<td>G</td>
<td>7</td>
<td>H</td>
<td>8</td>
<td>I</td>
</tr>
<tr>
<td>9</td>
<td>J</td>
<td>L</td>
<td>N</td>
<td>M</td>
<td>O</td>
</tr>
<tr>
<td>S</td>
<td>T</td>
<td>U</td>
<td>V</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

7.4 **Resetting the inverter**

Performing any of the following operations resets the inverter. Note that performing a reset clears (erases) the internal thermal integrated value of the electronic thermal relay function and the number of retries. Recover about 1s after reset is canceled.

- **Error (Err)** flickers on the operation panel during reset.
  - Operation 1 ....... Using the operation panel, perform a reset with the \( \text{STOP} \)
    (Enabled only when the inverter protective function is activated (major failure))
  - Operation 2 ....... Cut (off) power once, then switch it on again.
  - Operation 3 ....... Turn on the reset signal (RES). (Assign this signal to any of Pr. 60 to Pr. 63.) (Refer to page 35.)
7.5 Troubleshooting

POINTS
Check the corresponding areas. If the cause is still unknown, it is recommended to initialize the parameters (return to factory settings), re-set the required parameter values, and check again.

7.5.1 Motor remains stopped

1) Check the main circuit
   - Check that a proper power supply voltage is applied (operation panel display is provided).
   - Check that the motor is connected properly.
   - Check that the jumper across P-P1 is connected.

2) Check the input signals
   - Check that the start signal is input.
   - Check that both the forward and reverse rotation start signals are not input.
   - Check that the frequency setting signal is not zero.
   - Check that the AU signal is on when the frequency setting signal is 4 to 20mA.
   - Check that the output stop signal (MRS) or reset signal (RES) is not on.
     (Assign signals MRS and RES using Pr. 60 to Pr. 63 (input terminal function selection).)
   - Check that the sink or source jumper connector is fitted securely.

3) Check the parameter settings
   - Check that the reverse rotation prevention (Pr. 78) is not selected.
   - Check that the operation mode (Pr. 79) setting is correct.
   - Check that the bias and gain (C2 to C7) settings are correct.
   - Check that the starting frequency (Pr. 13) setting is not greater than the running frequency.
   - Check that various operational functions (such as three-speed operation), especially the maximum frequency (Pr. 1), are not zero.

4) Check the load
   - Check that the load is not too heavy.
   - Check that the shaft is not locked.

5) Others
   - Check that the operation panel display does not show an error (e.g. OC1).
   - Check that the Pr. 15 "jog frequency" setting is not lower than the Pr. 13 "starting frequency" value.
7.5.2 Motor rotates in opposite direction
- Check that the phase sequence of output terminals U, V and W is correct.
- Check that the start signals (forward rotation, reverse rotation) are connected properly.
- Check the setting of Pr. 17 "RUN key rotation direction selection".

7.5.3 Speed greatly differs from the setting
- Check that the frequency setting signal is correct. (Measure the input signal level.)
- Check that the following parameter settings are correct (Pr. 1, Pr. 2, Pr. 19, Pr. 38, Pr. 39, Pr. 95, C2 to C7).
- Check that the input signal lines are not affected by external noise. (Use shielded cables)
- Check that the load is not too heavy.

7.5.4 Acceleration/deceleration is not smooth
- Check that the acceleration and deceleration time settings are not too short.
- Check that the load is not too heavy.
- Check that the torque boost setting is not too large to activate the stall prevention function.

7.5.5 Motor current is large
- Check that the load is not too heavy.
- Check that the torque boost setting is not too large.

7.5.6 Speed does not increase
- Check that the maximum frequency setting is correct.
- Check that the load is not too heavy. (In agitators, etc., load may become heavier in winter.)
- Check that the torque boost setting is not too large to activate the stall prevention function.
- Check that the brake resistor is not connected to terminals P-P1 accidentally.

7.5.7 Speed varies during operation
   When slip compensation is selected, the output frequency varies with load fluctuation between 0 and 2Hz. This is a normal operation and is not a fault.
   1) Inspection of load
      - Check that the load is not varying.
   2) Inspection of input signal
      - Check that the frequency setting signal is not varying.
      - Check that the frequency setting signal is not affected by noise.
      - Check for a malfunction due to an undesirable current when the transistor output unit is connected.
   3) Others
      - Check that the wiring length is not too long.
Troubleshooting

7.5.8 Operation mode is not changed properly

If the operation mode does not change correctly, check the following:

1. External input signal
   - Check that the STF or STR signal is off. When it is on, the operation mode cannot be changed.

2. Parameter setting
   - Check the Pr. 79 setting.
   - When the Pr. 79 "operation mode selection" setting is "0", switching input power on places the inverter in the external operation mode.
   - Press the \( \text{PU} \) button to switch to the PU operation mode.
   - For other settings (1 to 8), the operation mode is limited accordingly.
   - (For details of Pr. 79, refer to page 30.)

7.5.9 Operation panel display is not operating

- Make sure that terminals PC-SD are not shorted.
- Make sure that the connector is fitted securely across terminals P-P1.

7.5.10 Parameter write cannot be performed

- Make sure that operation is not being performed (signal STF or STR is not ON).
- Check that the \( \text{WRITE} \) button was pressed.
- Make sure that you are not attempting to set the parameter outside the setting range.
- Make sure that you are not attempting to set the parameter in the external operation mode.
- Check Pr. 77 "parameter write disable selection".

7.5.11 Motor produces annoying sound

- Check the Pr. 70 "Soft-PWM setting" and Pr. 72 "PWM frequency selection" settings.
- Make sure that the deceleration time is not too short.
7.6 Precautions for maintenance and inspection

The inverter is a static unit mainly consisting of semiconductor devices. Daily inspection must be performed to prevent any fault from occurring due to the adverse effects of the operating environment, such as temperature, humidity, dust, dirt and vibration, changes in the parts with time, service life, and other factors.

7.6.1 Precautions for maintenance and inspection

For some short time after the power is switched off, a high voltage remains in the smoothing capacitor. When accessing the inverter for inspection, wait for at least 10 minutes after the power supply has been switched off, and then make sure that the voltage across the main circuit terminals P-N of the inverter is not more than 30VDC using a tester, etc.

7.6.2 Inspection item

(1) Daily inspection

• Basically, check for the following faults during operation.
  1) Motor operation fault
  2) Improper installation environment
  3) Cooling system fault
  4) Abnormal vibration, abnormal noise
  5) Abnormal overheat, discoloration

• During operation, check the inverter input voltages using a tester.

(2) Cleaning

Always run the inverter in a clean status. When cleaning the inverter, gently wipe dirty areas with a soft cloth immersed in neutral detergent or ethanol.

CAUTION

Do not use solvent, such as acetone, benzene, toluene and alcohol, as they will cause the inverter surface paint to peel off.

7.6.3 Periodic inspection

Check the areas inaccessible during operation and requiring periodic inspection. Consult us for periodic inspection.

1) Cooling system fault. Clean the air filter, etc.
2) Tightening check and retightening. The screws and bolts may become loose due to vibration, temperature changes, etc. Check and tighten them. Tighten them according to the specified tightening torque.
3) Check the conductors and insulating materials for corrosion and damage.
4) Measure insulation resistance.
5) Check and replace the cooling fan, smoothing capacitor and relay.
7.6.4 Insulation resistance test using megger

1) Before performing the insulation resistance test on the external circuit, disconnect the cables from all terminals of the inverter so that the test voltage is not applied to the inverter.

2) For the continuity test of the control circuit, use a tester (high resistance range) and do not use the megger or buzzer.

3) For the inverter, conduct the insulation resistance test on the main circuit only as shown below and do not perform the test on the control circuit. (use the 500VDC megger)

7.6.5 Pressure test

Do not conduct a pressure test. Deterioration may occur.

7.6.6 Daily and periodic inspection

<table>
<thead>
<tr>
<th>Area of Inspection</th>
<th>Inspection Item</th>
<th>Interval</th>
<th>Method</th>
<th>Criterion</th>
<th>Instrument</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer's check</td>
<td>Daily</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General</td>
<td>Overall unit</td>
<td>Periodic*</td>
<td>Visual and auditory check</td>
<td>No fault</td>
<td>Thermo-</td>
</tr>
<tr>
<td></td>
<td>Power supply</td>
<td></td>
<td></td>
<td></td>
<td>multimeter, digital multimeter</td>
</tr>
<tr>
<td></td>
<td>voltage</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Precautions for maintenance and inspection

#### General

<table>
<thead>
<tr>
<th>Inspection Item</th>
<th>Interval</th>
<th>Method</th>
<th>Criterion</th>
<th>Instrument</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Check with megger (across main circuit terminals and earth (ground) terminal).</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2) Check for loose screws and bolts</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(3) Check for overheat traces on the parts</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(4) Cleaning</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Conductors, cable

<table>
<thead>
<tr>
<th>Inspection Item</th>
<th>Interval</th>
<th>Method</th>
<th>Criterion</th>
<th>Instrument</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Check conductors for distortion</td>
<td></td>
<td>(1), (2) Visual check</td>
<td>No fault</td>
<td></td>
</tr>
<tr>
<td>(2) Check cable sheaths for breakage</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Terminal block

<table>
<thead>
<tr>
<th>Inspection Item</th>
<th>Interval</th>
<th>Method</th>
<th>Criterion</th>
<th>Instrument</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check for damage.</td>
<td></td>
<td>Visual check</td>
<td>No fault</td>
<td></td>
</tr>
<tr>
<td>Check resistance across terminals.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Inverter module, Converter module

<table>
<thead>
<tr>
<th>Inspection Item</th>
<th>Interval</th>
<th>Method</th>
<th>Criterion</th>
<th>Instrument</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check for liquid leakage.</td>
<td></td>
<td>(1), (2) Visual check</td>
<td>No fault</td>
<td></td>
</tr>
<tr>
<td>Check for safety valve projection and bulge.</td>
<td></td>
<td>(3) Measure with capacity meter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measure electrostatic capacity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Main circuit

<table>
<thead>
<tr>
<th>Inspection Item</th>
<th>Interval</th>
<th>Method</th>
<th>Criterion</th>
<th>Instrument</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check for chatter during operation.</td>
<td></td>
<td>(1) Auditory check (2) Visual check</td>
<td>No fault</td>
<td></td>
</tr>
<tr>
<td>Check for rough surface on contacts.</td>
<td></td>
<td></td>
<td>No fault</td>
<td></td>
</tr>
</tbody>
</table>

---

**Table of Inspection Items**

<table>
<thead>
<tr>
<th>Area of Inspection</th>
<th>Inspection Item</th>
<th>Interval</th>
<th>Method</th>
<th>Criterion</th>
<th>Instrument</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1) Check with megger (across main circuit terminals and earth (ground) terminal).</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2) Check for loose screws and bolts</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3) Check for overheat traces on the parts</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(4) Cleaning</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Conductors, cable</strong></td>
<td>(1) Check conductors for distortion</td>
<td>(1), (2) Visual check</td>
<td>No fault</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2) Check cable sheaths for breakage</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Terminal block</strong></td>
<td>Check for damage.</td>
<td>Visual check</td>
<td>No fault</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Check resistance across terminals.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Inverter module, Converter module</strong></td>
<td>Check for liquid leakage.</td>
<td>(1), (2) Visual check</td>
<td>No fault</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Check for safety valve projection and bulge.</td>
<td>(3) Measure with capacity meter</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Measure electrostatic capacity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Main circuit</strong></td>
<td>Check for chatter during operation.</td>
<td>(1) Auditory check (2) Visual check</td>
<td>No fault</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Check for rough surface on contacts.</td>
<td></td>
<td>No fault</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Precautions for maintenance and inspection

<table>
<thead>
<tr>
<th>Area of inspection</th>
<th>Inspection item</th>
<th>Interval</th>
<th>Method</th>
<th>Criterion</th>
<th>Instrument</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control circuit</td>
<td>Protective circuit</td>
<td>Daily</td>
<td>1 year</td>
<td>2 year</td>
<td>Digital multimeter, rectifier type voltmeter</td>
</tr>
<tr>
<td></td>
<td>Operation check</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1) Check balance of output voltages across phases with the inverter operated alone.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2) Perform sequence protective operation test to ensure no faults in protective and display circuits.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooling fan</td>
<td></td>
<td>(1) Check for unusual vibration and noise.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2) Check for loose screws and bolts.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Display</td>
<td>Indication</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1) Check for LED lamp blown.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2) Checking</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1) Check that the lamps are lit.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2) Cleaning.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Meter</td>
<td></td>
<td></td>
<td></td>
<td>Voltmeter, ammeter, etc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1) Check for unusual vibration and noise.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2) Check for unusual odor.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Insulation resistance</td>
<td>(1) Check with megger (across terminals and earth (ground) terminals).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2) Inspect cables from U, V, W (including motor cables).</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Consult us for periodic inspection.
Precautions for maintenance and inspection

Checking the inverter and converter module

<Preparation>
1. Disconnect the external power supply cables (R, S, T) and motor cables (U, V, W).
2. Prepare a tester. (Use 100Ω range).

<Checking method>
Change the polarity of the tester alternately at the inverter terminals R, S, T, U, V, W, P and N, and check for continuity.

CAUTION
• Before measurement, check that the smoothing capacitor is discharged.
• At the time of discontinuity, the measured value is almost ∞. When there is an instantaneous continuity, due to the smoothing capacitor, the tester may not indicate ∞. At the time of continuity, the measured value is several to several ten's-of ohms depending on the module type, circuit tester type, etc. If all measured values are almost the same, the modules are without fault.

Module device numbers and terminals to be checked

<table>
<thead>
<tr>
<th>Module</th>
<th>D1</th>
<th>D2</th>
<th>D3</th>
<th>D4</th>
<th>D5</th>
<th>D6</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td>P</td>
<td>Discontinuity</td>
<td>R</td>
<td>N</td>
<td>Discontinuity</td>
<td>N</td>
</tr>
<tr>
<td>P</td>
<td>Continuity</td>
<td>N</td>
<td>R</td>
<td>Continuity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>Continuity</td>
<td>N</td>
<td>R</td>
<td>Continuity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T</td>
<td>P</td>
<td>Discontinuity</td>
<td>T</td>
<td>N</td>
<td>Continuity</td>
<td>N</td>
</tr>
<tr>
<td>T</td>
<td>Continuity</td>
<td>N</td>
<td>T</td>
<td>Continuity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>U</td>
<td>Discontinuity</td>
<td>U</td>
<td>N</td>
<td>Continuity</td>
<td>U</td>
</tr>
<tr>
<td>U</td>
<td>Continuity</td>
<td>N</td>
<td>U</td>
<td>Continuity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>V</td>
<td>P</td>
<td>Discontinuity</td>
<td>V</td>
<td>N</td>
<td>Continuity</td>
<td>V</td>
</tr>
<tr>
<td>V</td>
<td>Continuity</td>
<td>N</td>
<td>V</td>
<td>Continuity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>W</td>
<td>P</td>
<td>Discontinuity</td>
<td>W</td>
<td>N</td>
<td>Continuity</td>
<td>W</td>
</tr>
<tr>
<td>W</td>
<td>Continuity</td>
<td>N</td>
<td>W</td>
<td>Continuity</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

( Assumes the use of an analog meter.)
Precautions for maintenance and inspection

7.6.7 Replacement of parts

The inverter consists of many electronic parts such as semiconductor devices. The following parts may deteriorate with age because of their structures or physical characteristics, leading to reduced performance or fault of the inverter. For preventive maintenance, the parts must be replaced periodically.

<table>
<thead>
<tr>
<th>Part Name</th>
<th>Standard Replacement Interval</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooling fan</td>
<td>2 to 3 years</td>
<td>Replace (as required)</td>
</tr>
<tr>
<td>Main circuit smoothing capacitor</td>
<td>10 years</td>
<td>Replace (as required)</td>
</tr>
<tr>
<td>On-board smoothing capacitor</td>
<td>10 years</td>
<td>Replace the board (as required)</td>
</tr>
<tr>
<td>Relays</td>
<td></td>
<td>Replace as required</td>
</tr>
</tbody>
</table>

CAUTION

For parts replacement, consult the nearest Mitsubishi FA Center.
Precautions for maintenance and inspection

(1) Cooling fan
The cooling fan is used to cool heat-generating parts such as the main circuit semiconductors. The life of the cooling fan bearing is usually 10,000 to 35,000 hours. Hence, the cooling fan must be replaced every 2 to 3 years if the inverter is run continuously. When unusual noise and/or vibration is noticed during inspection, the cooling fan must be replaced immediately.

<table>
<thead>
<tr>
<th>Inverter Type</th>
<th>Fan Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST-550DE-1.5K, 2.2K, 3.7K</td>
<td>MMF-060240S 8550-C04-0181</td>
</tr>
</tbody>
</table>

**Removal**
1) Remove the front cover and wiring cover. (Refer to page 1.)
2) Unplug the fan connectors. The cooling fan is connected to the cooling fan connector beside the main circuit terminal block of the inverter. Unplug the connector and separate the inverter from the cooling fan.
3) Remove the cooling fan cover. Disengage the fixing hooks pointed by arrows to remove the cooling fan cover.
4) Remove the cooling fan and cooling fan cover. The cooling fan is secured by the fixing hooks. Disengage the fixing hooks to remove the cooling fan and cooling fan cover.

**Reinstallation**
1) After confirming the orientation of the fan, reinstall the fan so that the arrow on the left of "AIR FLOW" faces up.
   **CAUTION**
   Installing the fan in the opposite air flow direction can cause the inverter life to be shorter.
2) Reinstall the fan cover to the inverter. Run the cable through the wiring groove to prevent it from being caught between the chassis and cover.
3) Reconnect the cable to the connector. (Refer to the previous page for the position of the connector.)
4) Reinstall the wiring cover.
Precautions for maintenance and inspection

(2) Smoothing capacitors
A large-capacity aluminum electrolytic capacitor is used for smoothing in the main circuit DC section, and an aluminum electrolytic capacitor is used for stabilizing the control power in the control circuit. Their characteristics are deteriorated by the adverse effects of ripple currents, etc. The replacement intervals greatly vary with the ambient temperature and operating conditions. When the inverter is operated in air-conditioned, normal environment conditions, replace the capacitors about every 10 years. When a certain period of time has elapsed, the capacitors will deteriorate more rapidly. Check the capacitors at least every year (less than six months if the life will be expired soon).

The appearance criteria for inspection are as follows:
1) Case: Check the side and bottom faces for expansion
2) Sealing plate: Check for remarkable warp and extreme crack.
3) Check for external crack, discoloration, fluid leakage, etc. Judge that the capacitor has reached its life when the measured capacitance of the capacitor reduced below 85% of the rating.

(3) Relays
To prevent a contact fault, etc., relays must be replaced according to the cumulative number of switching times (switching life).
7.6.8 Measurement of main circuit voltages, currents and powers

Measurement of voltages and currents
Since the voltages and currents on the inverter power supply and output sides include harmonics, measurement data depends on the instruments used and circuits measured. When instruments for commercial frequency are used for measurement, measure the following circuits with the instruments given on the next page.

Three-phase 200V power input

Examples of Measuring Points and Instruments

<table>
<thead>
<tr>
<th>Instrument types</th>
<th>Input voltage</th>
<th>Input current</th>
<th>Output voltage</th>
<th>Output current</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moving-iron type</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrodynamometer type</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moving-coil type</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rectifier type</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CAUTION
Use an FFT to measure the output voltages accurately. A tester or general measuring instrument cannot measure accurately.
### Precautions for maintenance and inspection

#### Measuring Points and Instruments

<table>
<thead>
<tr>
<th>Item</th>
<th>Measuring Point</th>
<th>Measuring Instrument</th>
<th>Remarks (Reference Measurement Value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply voltage V1</td>
<td>Across R-S, S-T, T-R</td>
<td>Moving-iron type AC voltmeter</td>
<td>Within permissible AC voltage fluctuation (Refer to page 62.)</td>
</tr>
<tr>
<td>Power supply side current I1</td>
<td>R, S, and T line currents</td>
<td>Moving-iron type AC ammeter</td>
<td></td>
</tr>
<tr>
<td>Power supply side power P1</td>
<td>R, S, and T and across R-, S-, T-</td>
<td>Electrodynamic type single-phase wattmeter</td>
<td>P1 = W11 + W12 + W13 (3-wattmeter method)</td>
</tr>
<tr>
<td>Power supply side power factor Pf1</td>
<td></td>
<td></td>
<td>Volatile: Power supply side current:</td>
</tr>
<tr>
<td>Output side voltage V2</td>
<td>Across U-V, V-W and W-U</td>
<td>Rectifier type AC voltmeter</td>
<td>Difference between the phases is within ±1% of the maximum output voltage.</td>
</tr>
<tr>
<td>Output side current I2</td>
<td>U, V and W line currents</td>
<td>Moving-iron type AC ammeter</td>
<td>Current should be equal to or less than rated inverter current. Difference between the phases is 10% or lower of the rated inverter current.</td>
</tr>
<tr>
<td>Output side power P2</td>
<td>U, V, W and U- V, V-W</td>
<td>Electrodynamic type single-phase wattmeter</td>
<td>P2 = W21 + W22 (3-wattmeter method (or 3-wattmeter method)</td>
</tr>
<tr>
<td>Output side power factor Pf2</td>
<td></td>
<td></td>
<td>Calculate in similar manner to power supply side power factor.</td>
</tr>
<tr>
<td>Converter output</td>
<td>Across P-N</td>
<td>Moving-coil type (such as tester)</td>
<td>Inverter LED display is lit</td>
</tr>
<tr>
<td>Frequency setting signal</td>
<td>Across 1(+)-5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency setting power supply</td>
<td>Across 10(+)-5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency meter signal</td>
<td>Across P-M(+)-SD</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Precautions for maintenance and inspection

**ERRORS AND PROTECTIVE FUNCTIONS**

- **Start signal**
  - **Select signal**
  - Across STF, STR, RH, RM, RL-SD
  - Moving-coil type (Tester and such may be used) (Internal resistance: 50kΩ or larger)
  - ON voltage: 1V or less
  - When open: 20 to 30VDC

- **Alarm signal**
  - Across A-C
  - Continuity check
  - Continuity check: <Normal> <Abnormal>
  - Across A-C: Continuity
  - Across B-C: Continuity

### CAUTION

1. Use an FFT to measure the output voltage accurately. An FA tester or general measuring instrument cannot measure accurately.
2. When the carrier frequency exceeds 5kHz, do not use this instrument since using it may increase eddy-current losses produced in metal parts inside the instrument, leading to burnout.
   - In this case, use the approximately effective value type instrument.

<table>
<thead>
<tr>
<th>Item</th>
<th>Measuring Point</th>
<th>Measuring Instrument</th>
<th>Remarks (Reference Measurement Value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start signal</td>
<td>Across STF, STR, RH, RM, RL-SD</td>
<td>Moving-coil type (Tester and such may be used) (Internal resistance: 50kΩ or larger)</td>
<td>ON voltage: 1V or less</td>
</tr>
<tr>
<td>Alarm signal</td>
<td>Across A-C, Across B-C</td>
<td>Moving-coil type (such as tester)</td>
<td>Continuity check: &lt;Normal&gt; &lt;Abnormal&gt;</td>
</tr>
</tbody>
</table>
## 8. SPECIFICATIONS

### 8.1 Ratings

(1) 3-phase 200V power supply

<table>
<thead>
<tr>
<th>Type FR-S520E-(-K (-C))</th>
<th>0.1</th>
<th>0.2</th>
<th>0.4</th>
<th>0.75</th>
<th>1.5</th>
<th>2.2</th>
<th>3.7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicable motor capacity (kW) (*1)</td>
<td>0.1</td>
<td>0.2</td>
<td>0.4</td>
<td>0.75</td>
<td>1.5</td>
<td>2.2</td>
<td>3.7</td>
</tr>
<tr>
<td>Rated capacity (kVA) (*2)</td>
<td>0.3</td>
<td>0.5</td>
<td>1.0</td>
<td>1.5</td>
<td>2.0</td>
<td>3.0</td>
<td>4.0</td>
</tr>
<tr>
<td>Rated current (A)</td>
<td>0.8</td>
<td>1.4</td>
<td>2.5</td>
<td>4.1</td>
<td>7.0</td>
<td>10</td>
<td>16.5</td>
</tr>
<tr>
<td>Overload current rating (*3)</td>
<td>150% 60s, 200% 0.5s (inverse time characteristics)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Voltage (*4)</td>
<td>Three-phase 200 to 240V 50Hz/60Hz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated input AC voltage/frequency</td>
<td>Three-phase 200 to 240V 50Hz/60Hz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Permissible AC voltage fluctuation</td>
<td>170 to 264V 50Hz/60Hz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Permissible frequency fluctuation</td>
<td>Within ±5%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power supply system capacity (kVA) (*5)</td>
<td>0.4</td>
<td>0.7</td>
<td>1.2</td>
<td>2.1</td>
<td>4.0</td>
<td>5.5</td>
<td>9</td>
</tr>
<tr>
<td>Protective structure (JEM1030)</td>
<td>Enclosed type (IP20), IP40 for totally enclosed structure series</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*1. The applicable motor capacity indicated is the maximum capacity applicable for use of the Mitsubishi 4-pole standard motor.

*2. The rated output capacity indicated assumes that the output voltage is 230V.

*3. The % value of the overload capacity indicates the ratio of the overload current to the inverter's rated output current. For repeated duty, allow time for the inverter and motor to return to or below the temperatures under 100% load.

*4. The maximum output voltage does not exceed the power supply voltage. You can set the maximum output voltage to any value below the power supply voltage. However, the pulse voltage value of the inverter output side voltage remains unchanged at about 10% of the power supply.

*5. The power supply capacity changes with the values of the power supply side inverter impedances (including those of the input reactor and cables).
## 8.2 Common specifications

<table>
<thead>
<tr>
<th>Control specifications</th>
<th>Control system</th>
<th>Selectable between soft-PWM control and high carrier frequency PWM control, selectable between V/F control and automatic torque boost control.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output frequency range</td>
<td>0.5 to 120Hz (starting frequency variable between 0 and 60Hz)</td>
<td></td>
</tr>
<tr>
<td>Frequency setting resolution</td>
<td>5VDC input: 1/1000 of max. set frequency, 10VDC, 4 to 20mADC input: 1/1000 of max. set frequency, Digital input: 0.1Hz (less than 100Hz), 1Hz (100Hz or higher)</td>
<td></td>
</tr>
<tr>
<td>Frequency accuracy</td>
<td>Analog input: Within ±1% of max. output frequency (±5°C±10°C), Digital input: Within ±0.5% of set output frequency (when set by the setting dial)</td>
<td></td>
</tr>
<tr>
<td>Starting torque</td>
<td>150% (at 6Hz) during automatic torque boost control</td>
<td></td>
</tr>
<tr>
<td>Acceleration/deceleration time setting</td>
<td>0.1 to 999s (acceleration and deceleration can be set individually), linear or S-pattern acceleration/deceleration mode can be selected.</td>
<td></td>
</tr>
<tr>
<td>Braking torque</td>
<td>DC injection, regeneration (0.1K, 0.2K, 0.5K, 1.0K, 1.5K, 2.2K, 3.7K, 20%)</td>
<td></td>
</tr>
<tr>
<td>Output stop</td>
<td>Instantaneous shut-off of inverter output (frequency, voltage)</td>
<td></td>
</tr>
<tr>
<td>Current input selection</td>
<td>Used to select frequency setting signal 4 to 20mA (terminal 4)</td>
<td></td>
</tr>
<tr>
<td>External thermal relay contact input</td>
<td>Thermal relay contact input for use when the inverter is stopped by the external thermal relay.</td>
<td></td>
</tr>
<tr>
<td>PID control valid</td>
<td>Selection for exercising PID control</td>
<td></td>
</tr>
<tr>
<td>PU operation mode switch</td>
<td>Used to select between PU operation and external operation from outside the inverter.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Input signals</th>
<th>Start signal</th>
<th>STF, STR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alarm reset</td>
<td>Used to reset alarm output when protective function is activated.</td>
<td></td>
</tr>
<tr>
<td>Multi-speed selection</td>
<td>Up to 15 speeds can be selected. (Each speed can be set between 0 and 120Hz, running speed can be changed during operation from the operation panel.)</td>
<td></td>
</tr>
<tr>
<td>Second function selection</td>
<td>Used to select second functions (acceleration time, deceleration time, torque boost, base frequency, electronic thermal relay function).</td>
<td></td>
</tr>
<tr>
<td>Output stop</td>
<td>Instantaneous shut-off of inverter output (frequency, voltage)</td>
<td></td>
</tr>
<tr>
<td>Current input selection</td>
<td>Used to select frequency setting signal 4 to 20mA (terminal 4).</td>
<td></td>
</tr>
<tr>
<td>External thermal relay contact input</td>
<td>Thermal relay contact input for use when the inverter is stopped by the external thermal relay.</td>
<td></td>
</tr>
<tr>
<td>PID control valid</td>
<td>Selection for exercising PID control</td>
<td></td>
</tr>
<tr>
<td>PU operation mode switch</td>
<td>Used to select between PU operation and external operation from outside the inverter.</td>
<td></td>
</tr>
</tbody>
</table>
### Common specifications

#### Operational functions
- Maximum and minimum frequency settings, frequency jump operation, external thermal relay input selection, automatic restart after instantaneous power failure, forward/reverse rotation prevention, slip compensation, operation mode selection, PID control, computer link operation (RS-485).

#### Operating Status
- 1 open collector signal can be selected from among inverter running, up-to-frequency, frequency detection, overload warning, zero current detection, output current detection, PID upper limit, PID lower limit, PID forward/reverse rotation, operation ready, current average value, monitor signal, maintenance timer alarm, minor failure and alarm. 1 contact output (1 contact, 230V 0.3AAC, 30V 0.3ADC) signal can be selected.

#### Control specifications

<table>
<thead>
<tr>
<th>Operational functions</th>
<th>Maximum and minimum frequency settings, frequency jump operation, external thermal relay input selection, automatic restart after instantaneous power failure, forward/reverse rotation prevention, slip compensation, operation mode selection, PID control, computer link operation (RS-485).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output signals</td>
<td>I signal can be selected from between output frequency and motor current. Pulse train output (1440 pulses/s, 1mA full scale). Use Pr. 64 and Pr. 65 for selection.</td>
</tr>
<tr>
<td>Protective/warning function</td>
<td>Overcurrent shut-off (during acceleration, deceleration, constant speed), regenerative overvoltage shut-off (during acceleration, deceleration, constant speed), overload shut-off (electronic thermal relay function), heatsink overheat, fan failure (*3), stall prevention, brake transistor alarm, brake resistor overheat protection, start-time output side earth (ground) fault protection (*4), external thermal relay (*5), disconnected PU, retry count excess, communication error, CPU error, undervoltage (*1).</td>
</tr>
</tbody>
</table>

#### Environment
- **Ambient temperature**: -10°C to +50°C (non-freezing) (-10°C to +40°C (14°F to 104°F) for totally enclosed structure feature).
- **Ambient humidity**: 90%RH or less (non-condensing).
- **Storage temperature**: -20°C to +65°C.
- **Atmosphere**: Indoors (without corrosive gas, flammable gas, oil mist, dust and dirt etc.).
- **Altitude, vibration**: Maximum 1000m above seal level, 5.9m/s² or less (conforms to JIS C 0040).

1. When undervoltage or instantaneous power failure occurs, no alarm output is provided but the output is shut off. After power restoration, the inverter may be run as it is. Depending on the running status (e.g. load magnitude), however, overcurrent, regenerative overvoltage or other protection may be activated at power restoration. (in the external operation mode)

2. The braking torque indicated is a short-duration average torque (which varies with motor loss) when the motor alone is decelerated from 60Hz in the shortest time and is not a continuous regenerative torque. When the motor is decelerated from the frequency higher than the base frequency, the average deceleration torque will reduce. Since the inverter does not contain a brake resistor, use an optional brake resistor when regenerative energy is large. (The brake resistor can not be used with the 0.1K and 0.2K.) A brake unit (BU) may also be used.

3. Compatible with only the product having the built-in cooling fan.

4. Activated only when “1” is set in Pr. 40 “start-time earth (ground) fault detection selection”.

5. Activated only when external thermal relay input (OH) is selected in any of Pr. 60 to Pr. 63 (input terminal function selection).

6. Temperature applicable for a short period such as transportation.
9. OUTLINE DRAWINGS

- FR-S520E-0.1K, 0.2K, 0.4K, 0.75K

### 3-phase 200V power supply

<table>
<thead>
<tr>
<th>Capacity</th>
<th>D</th>
<th>D1</th>
<th>D2</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1K, 0.2K</td>
<td>80.5</td>
<td>10</td>
<td>52</td>
</tr>
<tr>
<td>0.4K</td>
<td>112.5</td>
<td>42</td>
<td>52</td>
</tr>
<tr>
<td>0.75K</td>
<td>132.5</td>
<td>62</td>
<td>52</td>
</tr>
</tbody>
</table>

**REMARKS**

For sizes of the totally enclosed structure type, refer to sizes of the standard type inverter of the same capacity.
OUTLINE DRAWINGS

- FR-S520E-1.5K, 2.2K, 3.7K

3-phase 200V power supply

<table>
<thead>
<tr>
<th>Capacity</th>
<th>W</th>
<th>W1</th>
<th>D</th>
<th>D1</th>
<th>D2</th>
<th>D3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5K-2.2K</td>
<td>168</td>
<td>96</td>
<td>135.5</td>
<td>65</td>
<td>52</td>
<td>5</td>
</tr>
<tr>
<td>3.7K</td>
<td>170</td>
<td>168</td>
<td>142.5</td>
<td>72</td>
<td>52</td>
<td>5</td>
</tr>
</tbody>
</table>

(Unit: mm)
• Parameter unit (FR-PU04)

Choose the mounting screws whose length will not exceed the effective depth of the mounting threads.
Appendix 1 Instructions for compliance with the European Directive

(The products conforming to the Low Voltage Directive carry the CE mark.)

(1) EMC Directive

1) Our view of transistorized inverters for the EMC Directive

A transistorized inverter is a component designed for installation in a control box and for use with the other equipment to control the equipment/device. Therefore, we understand that the EMC Directive does not apply directly to transistorized inverters. For this reason, we do not place the CE mark on the transistorized inverters. (The CE mark is placed on inverters in accordance with the Low Voltage Directive.) The European power drive manufacturers’ organization (CEMEP) also holds this point of view.

2) Compliance

We understand that the transistorized inverters are not covered directly by the EMC Directive. However, the EMC Directive applies to machines/equipment into which transistorized inverters have been incorporated, and these machines and equipment must carry the CE marks. Hence, we prepared the European Standard-compliant noise filters and the technical information “EMC Installation Guidelines” (information number BCN-A21041-202) so that machines and equipment incorporating transistorized inverters may conform to the EMC Directive more easily.

3) Outline of installation method

Install an inverter using the following methods:

- Use the inverter with an European Standard-compliant noise filter.
- For wiring between the inverter and motor, use shielded cables or run them in a metal piping and earth (ground) the cables on the inverter and motor sides with the shortest possible distance.
- Insert a line noise filter and ferrite core into the power and control lines as required.

Full information including the European Standard-compliant noise filter specifications are written in the technical information “EMC Installation Guidelines” (BCN-A21041-202). Please contact your sales representative.
(2) Low Voltage Directive

1) Our view of transistorized inverters for the Low Voltage Directive

Transistorized inverters are covered by the Low Voltage Directive (Standard to conform to: EN50178).

2) Compliance

We have self-confirmed our inverters as products compliant to the Low Voltage Directive and place the CE mark on the inverters.

3) Outline of instructions

* Do not use an earth leakage circuit breaker as an electric shock protector without connecting the equipment to the earth. Connect the equipment to the earth securely.
* Wire the earth terminal independently. (Do not connect two or more cables to one terminal.)
* Use the cable sizes on page 8 under the following conditions.
  - Ambient temperature: 40°C maximum
  - Wire installation: On wall without ducts or conduits

If conditions are different from above, select appropriate wire according to EN60204 ANNEX C TABLE 5.

* Use the no-fuse breaker and magnetic contactor which conform to the EN or IEC Standard.

* Use the breaker of type B (breaker which can detect both AC and DC). If not, provide double or enhanced insulation between the inverter and other equipment, or put a transformer between the main power supply and inverter.
* Use the inverter under the conditions of overvoltage category II and contamination level 2 or higher specified in IEC664.
  (a) To meet the overvoltage category II, insert an EN or IEC standard-compliant insulating transformer or surge suppressor in the input of the inverter.
  (b) To meet the contamination level 2, install the inverter in a control box protected against ingress of water, oil, carbon, dust, etc. (IP54 or higher).

* On the input and output of the inverter, use cables of the type and size set forth in EN60204 Appendix C.

* The operating capacity of the relay outputs (terminal symbols A, B, C) should be 30VDC, 0.3A.

* The terminals indicated as the control circuit input and output terminals on page 9 are separated safely from the main circuit.

* Environment

<table>
<thead>
<tr>
<th></th>
<th>During operation</th>
<th>In storage</th>
<th>During transportation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient Temperature</td>
<td>-10°C to +50°C</td>
<td>-20°C to +65°C</td>
<td>-20°C to +65°C</td>
</tr>
<tr>
<td>Ambient Humidity</td>
<td>80% RH or less</td>
<td>90% RH or less</td>
<td>90% RH or less</td>
</tr>
<tr>
<td>Maximum Altitude</td>
<td>1,000m</td>
<td>1,000m</td>
<td>10,000m</td>
</tr>
</tbody>
</table>

Details are given in the technical information "Low Voltage Directive Conformance Guide" (BCN-A21041-203). Please contact your sales representative.
Appendix 2 Instructions for UL and cUL

(Standard to comply with: UL 508 C, CSA C22.2 No.14)

1. Installation
The S500E is UL-listed as a product for use in an enclosure.
Design the enclosure so that the ambient temperature, humidity and ambience of the inverter will satisfy the above specifications. (Refer to page 84)

Branch circuit protection
For installation in the United States, branch circuit protection must be provided in accordance with the National Electrical Code and any applicable local codes.
For installation in Canada, branch circuit protection must be provided in accordance with the Canada Electrical Code and any applicable provincial codes.

2. Wiring of the power supply and motor
For wiring the input (R, S, T) and output (U, V, W) terminals of the inverter, use the UL-listed copper wires (rated at 75°C) and round crimping terminals. Crimp the crimping terminals with the crimping tool recommended by the terminal maker.

3. Short circuit ratings
Suitable For Use in A Circuit Capable Of Delivering Not More Than 5kA rms Symmetrical Amperes.
4. Motor overload protection

These inverters provide solid state motor overload protection.
Set parameter 9 using the following instructions,
(Pr. 9 "electronic thermal O/L relay").

<Setting>

• Set the rated current [A] of the motor.
  (Normally set the rated current at 50Hz.)
• Setting "0" makes the electronic thermal relay function (motor protective function) invalid. (The inverter's protective function is valid).
• When using a Mitsubishi constant-torque motor, first set "1" in Pr. 71 to choose the 100% continuous torque characteristic in the low-speed range. Then, set the rated motor current in Pr. 9.

CAUTION

• When two or more motors are connected to the inverter, they cannot be protected by the electronic thermal relay function. Install an external thermal relay to each motor.
• When the difference between the inverter and motor capacities is large and the setting is small, the protective characteristics of the electronic thermal relay function will be deteriorated.
  In this case, use an external thermal relay.
• A special motor cannot be protected by the electronic thermal relay function. Use an external thermal relay.

Reference: Motor overload protection characteristics

[Graph and table showing settings and protections]
For Maximum Safety

- Mitsubishi transistorized inverters are not designed or manufactured to be used in equipment or systems in situations that can affect or endanger human life.
- When considering this product for operation in special applications such as machinery or systems used in passenger transportation, medical, aerospace, atomic power, electric power, or submarine repeating applications, please contact your nearest Mitsubishi sales representative.
- Although this product was manufactured under conditions of strict quality control, you are strongly advised to install safety devices to prevent serious accidents when it is used in facilities where breakdowns of the product are likely to cause a serious accident.
- Please do not use this product for loads other than three-phase induction motors.