

# PIEZO FEEDER CONTROLLER

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## Instruction Manual

### High-Function Type

P212-F

P312-F

This Instruction Manual is applicable to Piezo Feeder Controller version 1 and later. Confirm the version information displayed upon powering ON.

Read the Manual carefully beforehand to ensure the safe use of the Controller. After reading, store the Manual within reach so as to be ready for rereading. The dealer is requested to be sure to deliver the Manual to the end user.



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## 1. Introduction

Thank you for your selection of our Piezo Feeder Controller, a digital controller for piezo feeder (“Controller”).

The piezo feeder is a high-efficiency, energy-saving parts feeder driven by piezoelectric elements.

In combination with the dedicated digital controller, the Controller can be operated easily and efficiently without requiring any difficult adjustment. Before connecting the piezo feeder and performing subsequent adjustment, read the Manual carefully to ensure proper use of the excellent functions of the piezoelectric parts feeder.

## 2. Before Using

Before unpacking, be careful not to have an impact or vibration on the packing.

Unpack, and check the following:

(1) Isn't there any damage caused during transport?

(2) Are the rating, capacity and model on the nameplate exactly what you have ordered?

If there is any problem, contact the dealer.

## 3. Precautions for Safety

Be sure to read the Manual carefully before the installation, operation, maintenance, checkup, etc. of the Controller to ensure your familiarity with the Controller, safety information and precautions.

In the Manual, the safety precautions are divided into “DANGER” and “CAUTION” according to their severities.

|  |   |
|--|---|
|  <b>DANGER</b>  | If the Controller is handled improperly, a dangerous situation could be caused, and the possibility of death or injury is assumed.                          |
|  <b>CAUTION</b> | If the Controller is handled improperly, a dangerous situation could be caused, and the possibility of medium or minor injury or partial damage is assumed. |

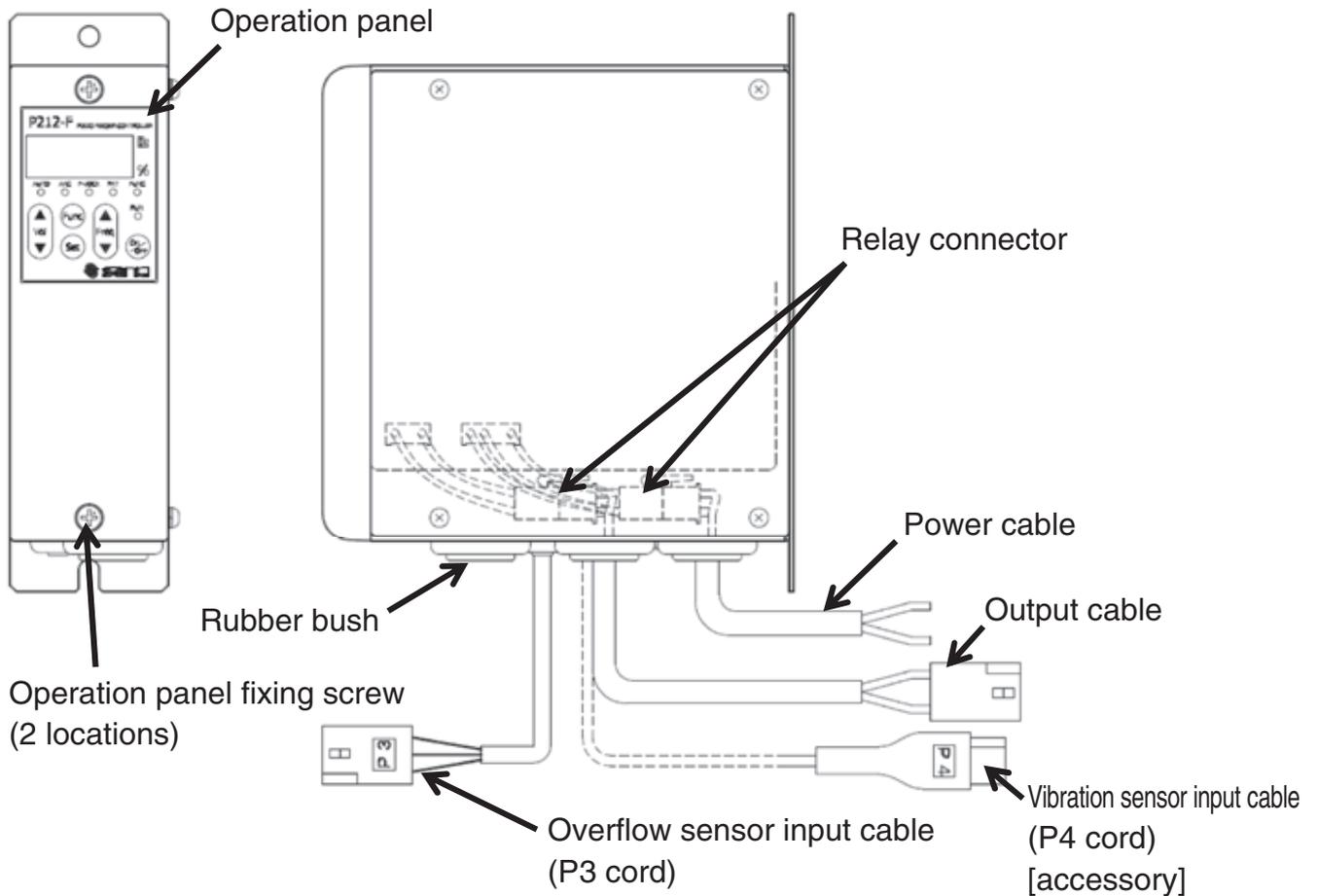
## **DANGER**

- Do not service the Controller in the Power-ON status. To avoid an electric shock, be sure to turn OFF the power supply before starting the service.
- Do not disassemble, remodel or repair the Controller, or an electric shock, a fire or injury could be caused. For repair, ask the dealer.
- Do not remove the front cover while the Controller is in the Power-ON status, or an electric shock could be caused.
- Do not put or insert anything in or into the Controller, or an electric shock or a fire could be caused.
- Do not use the Controller near explosive or flammable gas, or a fire could be caused.
- Do not splash water or liquid, or an electric shock or a fire could be caused.
- If smoke, odor or abnormal noise is emitted or other abnormality is detected, shut down the Controller immediately. If the Controller is used in the abnormal status, a fire could be caused. Contact the dealer.
- If the Controller is not operated for a long time, shut down the Controller. If the Controller is left live as it is, a fire could be caused.
- Connect the power cable and the output cable as instructed in the Manual to avoid an electric shock and a fire.
- Do not forcedly bend, pull or pinch the power cable or the output cable, or an electric shock or a fire could be caused.
- Ground the earth terminal and the ground prescribed portions without fail, or an electric shock could be caused. When working on grounding to a high position or a shaky stand, because fall or tumble could be caused conditionally, take measures to prevent fall or tumble.
- Do not conduct megger testing for any terminals other than the input terminal.

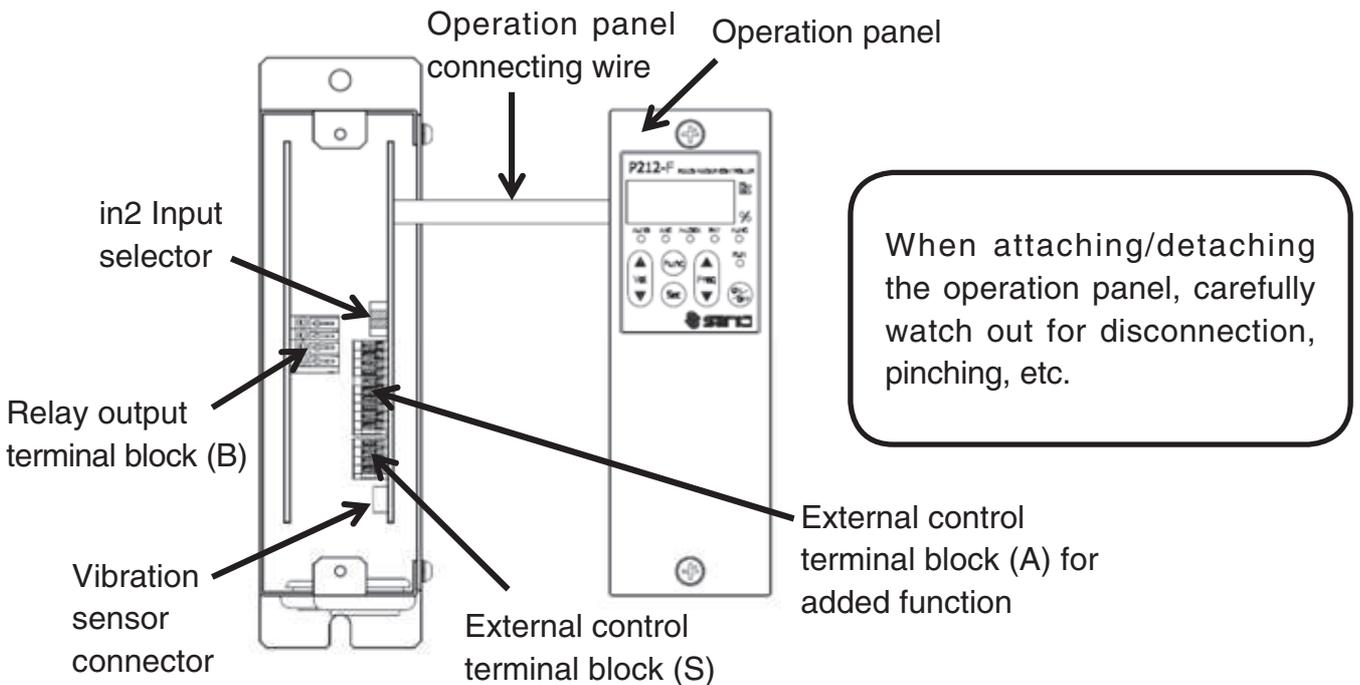
## **CAUTION**

- Do not use the Controller for an electromagnetic parts feeder or the like.
- Do not turn ON/OFF the power supply frequently, or failure could be caused.
- Do not start/stop the vibrator with an electromagnetic contactor or the like on the output side, or failure could be caused.
- Do not perform welding work on the vibrator side in the Power-ON status.
- Do not perform welding work on the vibrator side when the vibrator and the Controller are in the connected status.
- Do not remove the nameplate, the seal, or the like.
- When installing the Controller, hold and fix it firmly and properly.
- Do not transport or carry the Controller in the piled-up status, even in the packed status, or they could fall, causing injury.
- Do not place the Controller outdoors, in a humid place or in a place with excessive temperature change.
- Do not pile up the Controller two-tiered or more, even in the packed status.
- When disposing of the Controller, dispose it properly as general industrial waste.

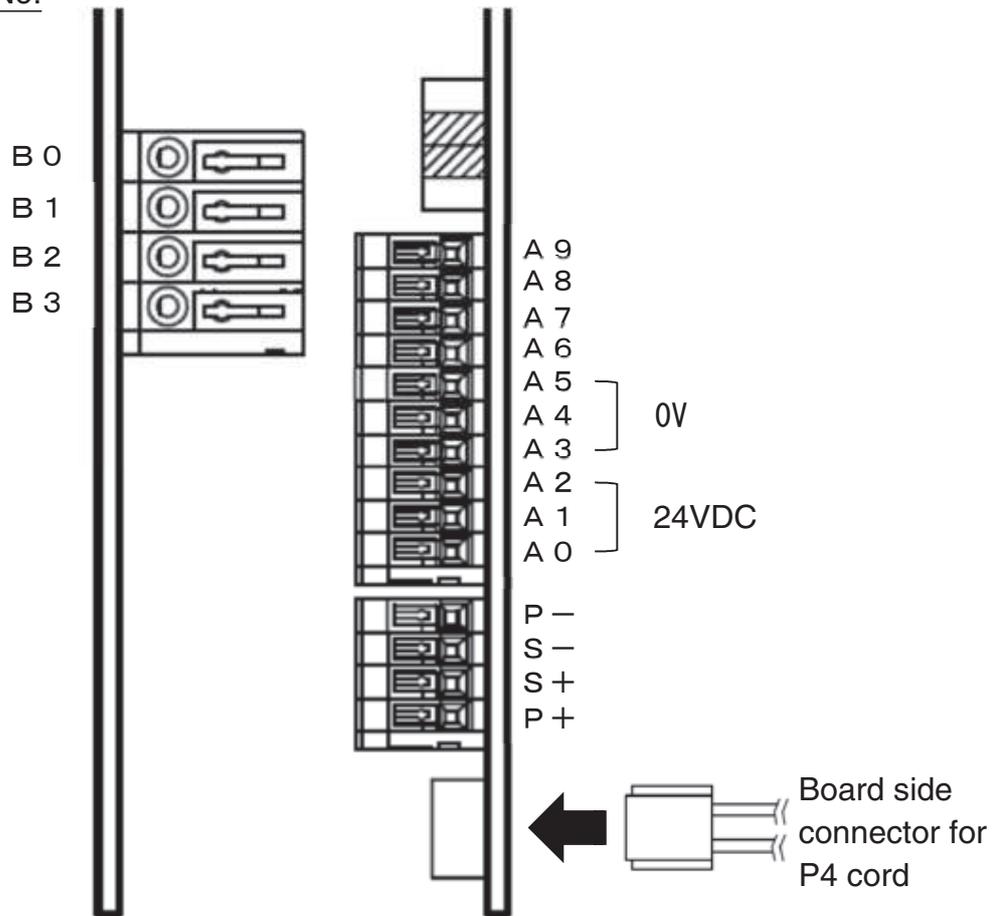
4. Name of each unit



Operation panel removed status

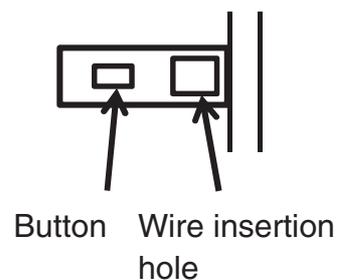


Terminal block No.



Wiring to the external signal terminal block (screw-less)

While holding down the button on the terminal block with a flat-blade screwdriver or the like, insert the wire into the wire insertion hole. Then, detach the flat-blade screwdriver to release the button, and the wire will be fixed.

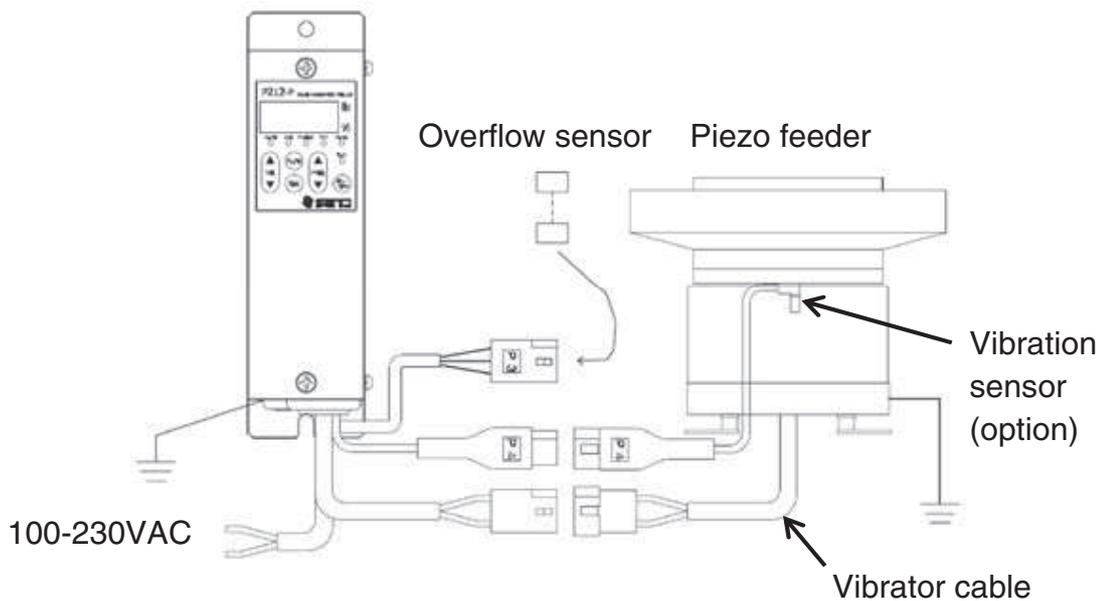


Applicable wire size

- Terminal block (A), (S)  
Stranded wire: 0.08 – 0.32mm<sup>2</sup> (AWG28 – 22), Strand diameter:  $\phi$ 0.12mm or more  
Solid wire:  $\phi$ 0.32 – 0.65mm (AWG28 – 22)
- Terminal block (B)  
Stranded wire: 0.2 – 0.75mm<sup>2</sup> (AWG24 – 20), Strand diameter:  $\phi$ 0.18mm or more  
Solid wire:  $\phi$ 0.4 – 1.2mm (AWG26 – 16)

Cover removed length: 9 – 10mm

## 5. Connection of Inputs and Outputs



### 1) Connection to the vibrator

Confirm that the power supply is in the OFF status. Then, connect the output cable of the Controller to the vibrator cable of the piezo feeder.

The connector wire colors should be identified as follows:



※1: Do not connect any vibrator other than the piezo feeder made by Sanki.

※2: Do not operate with no load.

※3: Be sure to ground the vibrator.

### 2) Connection to the power source

Connect the power cable to the single-phase power source.

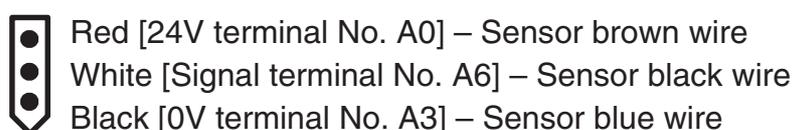
Do not turn ON the power supply until the whole wiring work is completed.

※1: Be sure to make a connection to the utility power source.

※2: Be sure to ground the Controller.

### 3) Connection of the overflow sensor

Connect the overflow sensor to the terminal of the overflow sensor input cable (P3 cord).



※1 The overflow sensor input cable (P3 cord) is connected to the internal terminal block [in2 Input]. Details ⇒ P. 18.

※2 If the overflow sensor is not used, set to “Parameter No. 07 = Lo.”

#### 4) Connection of the vibration sensor

When conducting the constant-amplitude control, firmly connect the vibration sensor input cable (P4 cord) (accessory) to the connector on the board for connection to the vibration sensor (KS-3).

Firmly fix the vibration sensor to the vibrator.

※To connect the vibration sensor input cable, the operation panel has to be detached.

Confirm the power-OFF status, and then detach the operation panel.

Note that the operation panel is connected to the Controller main body with a connecting wire. When attaching/detaching the operation panel, carefully watch out for the connecting wire to avoid disconnection or pinching.

※Limit the total length of the cable between the Controller and the vibrator (vibration sensor) to 4m.

To extend the cable, be sure to use the dedicated cable.

In wiring each cable, detach the wiring from the power cable.

#### 5) Connection of the external signal [in1 Input]

Connect the external signal to operate/stop the vibrator in addition to the overflow sensor. When the external signal is used, set as “Parameter No. 06 = Hi.”

※To connect the external signal, the operation panel should be removed.

Confirm that the power supply is in the OFF status. Then, detach the operation panel.

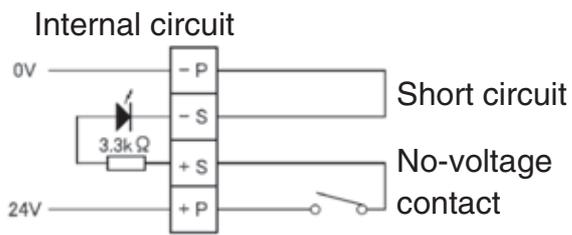
The operation panel is connected to the main unit of the Controller with a connecting wire. When attaching/detaching the operation panel, carefully watch out for disconnection or pinching.

To operate the start/stop of the Controller according to external control signal, either method of non-voltage contact signal or voltage signal (24VDC) can be used.

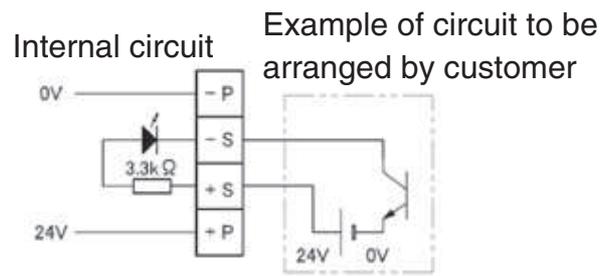
Make connection to the external control terminal block by using the method ① or ② below while watching out for the signal to be used and the connection method. When wiring, be careful not to make mistake about the polarity.

The current of 24VDC and 10mA or less flows between [+S] and [-S]. Carefully select the connection device (e.g., minute current relay).

① No-voltage contact signal



② Voltage signal (24VDC)



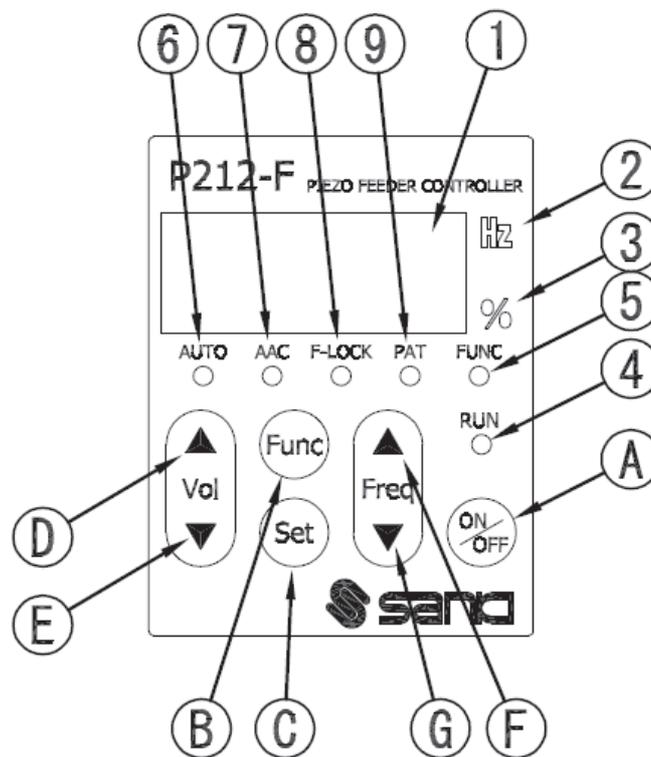
[Relation between [in1 Input] and [in2 Input]]

- ① When [in1] is in the operating condition, [in2] is enabled.
- ② When both [in1] and [in2] are in the operating condition, the vibrator starts operation.

|                              | Signal input status     |                         | Vibrator operation condition                    |   |
|------------------------------|-------------------------|-------------------------|---|---|
|                              |                         |                         | Setting: Hi                                     | Setting: Lo                                     |
| in1 Input<br>Parameter No. 6 | Connection ① :<br>Close | Connection ② :<br>24VDC | Operation<br>condition                          | <input type="checkbox"/> Stop                   |
|                              | Connection ① :<br>Open  | Connection ② :<br>0V    | Stop  | <input type="checkbox"/> Operation<br>condition |
| In2 Input<br>Parameter No. 7 | Sensor signal: ON       |                         | <input type="checkbox"/> Operation<br>condition | Stop  |
|                              | Sensor signal: OFF      |                         | <input type="checkbox"/> Stop                   | Operation<br>condition                          |

: Default

## 6. Explanation of Operation Panel



### 1) Pilot lamps

| No. | Name                                  | Function  |
|-----|---------------------------------------|---|
| ①   | Data display                          | A 7-segment, 4-digit LED<br>Displays voltage, frequency, each setting and error code.   |
| ②   | Frequency pilot lamp                  | ON when the data display is showing frequency   |
| ③   | Voltage % pilot lamp                  | ON when the data display is showing voltage   |
| ④   | Operation pilot lamp                  | Indicates the output condition of the Controller.<br>ON: The Controller is in operation under external control.<br>Blinking: The Controller is in forced operation by the ON/OFF key.<br>Long OFF and blinking: The Controller is at a forced stop by the ON/OFF key. |
| ⑤   | Parameter mode pilot lamp             | ON when the parameter is being set  |
| ⑥   | Operation mode pilot lamp             | ON: Operation mode<br>OFF: Adjustment mode<br>Blinking: Selecting operation mode  |
| ⑦   | Constant-amplitude control pilot lamp | ON when the constant-amplitude is being set*  |
| ⑧   | Frequency lock pilot lamp             | Indicates the fixed frequency setting and the automatic frequency tracking setting*.  |
| ⑨   | Operation pattern setting pilot lamp  | ON: Panel setting<br>OFF: External signal setting<br>Blinking: Selection is in process.   |

The lighting status of ⑦ AAC and ⑧ F-LOCK indicating the setting status of the constant-amplitude control and automatic frequency tracking

| Control setting | Parameter q = on |        |             |        | Parameter q = off |        |             |        |
|-----------------|------------------|--------|-------------|--------|-------------------|--------|-------------|--------|
|                 | F-LOCK = off     |        | F-LOCK = on |        | F-LOCK = off      |        | F-LOCK = on |        |
|                 | AAC              | F-LOCK | AAC         | F-LOCK | AAC               | F-LOCK | AAC         | F-LOCK |
| U0              | ○                | ○      | ○           | ●      | ○                 | ○      | ○           | ●      |
| U1              | ●                | ◐      | ●           | ◐      | ●                 | ◐      | ●           | ◐      |
| U2              | ●                | ○      | ●           | ●      | ●                 | ○      | ●           | ●      |

○ : OFF, ● : ON , ◐ : Blinking, ◑ : ON at a stop, blinking in operation

## 2) Operation keys

| No. | Name          | Description   |
|-----|---------------|---|
| A   | ON/OFF key    | Performs the forced operation and the forced stopping.  |
| B   | Func key      | Brief pressing: Selects the function.<br>Long pressing: Switches the mode between the parameter mode and the normal mode.   |
| C   | Set key       | Brief pressing: Changes and locks the data.<br>Long pressing: Saves the data (voltage, frequency, each setting).<br>Starts frequency search, and loads and saves the data.  |
| D   | Vol UP key    | Normal mode: Adjusts the output voltage.<br>When pressed briefly when the frequency is being displayed, the frequency display switches to the voltage display.<br>Parameter mode: Selects the parameter No.   |
| E   | Vol DOWN key  |   |
| F   | Freq UP key   | Normal mode: Adjusts the frequency.<br>When pressed briefly when the voltage is being displayed, the voltage display switches to the frequency display.<br>Functional selection: Changes the settings.<br>Parameter mode: Changes the parameter data. |
| G   | Freq DOWN key |   |

## 7. Display Mode

- Normal mode: Shows and sets the output voltage or the frequency on the data display
- Parameter mode: Shows and sets the parameter on the data display

When the Func key is pressed long for over 2 sec, the mode switches.

Regardless of the display mode, operation and stopping through the panel and under the external control is enabled.

### 1) Setting the function

In the normal mode, when the Func key is pressed when the output voltage or the frequency is being displayed, each pilot lamp starts blinking in order of

AUTO → FLOCK → PAT → AUTO,

and respective setting items are displayed on the data display.

To select the setting, press the Freq UP/DOWN keys.

To change the setting, press the Set key.

When the setting change is completed, the data display shows the voltage.

If the setting moves to the next item by pressing the Func key without pressing the Set key when the settings are being changed, the settings are not changed.

※If the key operation is not tried for over 5 min, the data display shows the voltage.

#### ①AUTO: Selects the operation mode.

The mode is switched in order of n → Srch → tuni → A → n.

| Data display | Mode                       | Function   |
|--------------|----------------------------|--|
| A            | A mode (operation)         | The vibrator operates according to each operation pattern settings. This mode is enabled when the constant-amplitude control and the automatic frequency tracking functions are set. The voltage and the frequency themselves cannot be changed. |
| n            | n mode (adjustment)        | The vibrator operates with VVVF. Adjusts the amplitude, and loads and saves the data.  |
| Srch         | Automatic frequency tuning | Searches the resonance frequency.  |
| tuni         | Tuning                     | Searches for the characteristics of the vibrator at 30% output.  |

#### ②F-LOCK: Sets the frequency lock

Sets whether the frequency should be locked or not in the n mode.

Set to the operation memory.

#### ③PAT: Switches the operation pattern.

Px (x = 1 – 4): Displays the panel settings (operation pattern loaded to the current operation memory).

Also loads and saves the operation pattern.

OUTx (x = 1 – 4): Displays the operation pattern of the external signal in3 status.

## 2) Setting the parameter

- (1) When the Func key is pressed long for over 2 sec in the normal mode, the FUNC lamp lights up and the mode switches to the parameter mode.  
The data display shows the current parameter set value.  
The operation is enabled when the Controller is in either condition, at a stop and in operation.
- (2) Select the parameter to be changed ( $\Rightarrow$  P. 21) by pressing the Vol UP/DOWN keys.
- (3) When the Set key is pressed, the parameter No. (left 2 digits) starts blinking, and the set value can now be changed. Change the set value by pressing the Freq UP/DOWN keys.
- (4) When the Set key is pressed, the parameter No. lights up, and the change is saved temporarily.
- (5) When the power supply is turned OFF in this status, the saved contents are cleared.  
Save the parameter to the operation pattern to be changed.
- (6) Press the Func key long for over 2 sec to switch the mode to the normal mode.
- (7) Press the Func key to make the PAT lamp blink.  
The operation pattern (Px or OUTx) is displayed on the data display.
- (8) Press the Freq UP/DOWN keys to select the operation pattern (Px), and press the Set key.
- (9) "LoAd" is displayed on the data display. Press the Freq UP/DOWN keys to select "SAVE," and press the Set key.
- (10) "SV 1" is displayed on the data display. Press the Freq UP/DOWN keys to select the operation pattern to be changed, and press the Set key long for over 2 sec.  
"SAVE" is displayed in blinking on the data display, and the mode switches to the normal mode, and the voltage is displayed.

※If the key operation is not tried for over 5 min, the mode switches to the normal mode, and the data display shows the voltage.

## 8. First-Time Use

Flow up to operation start

Input/output connection

- Connect the input and the output, and connect the overflow sensor.
- Connect the vibration sensor, and connect the external I/O signals.



Default setting

- Make setting according to the vibrator usage.
- Set the parameter (added function).



Amplitude adjustment

Adjust the amplitude to optimize the work transfer speed.

① Constant-voltage mode (U = 0)

Output the set output voltage and the frequency for a certain length of time.

- Vibration sensor (KS-3) not available
- Set the output voltage and the frequency manually.

② Constant-amplitude mode (U = 2)

Make the amplitude constant by controlling the output voltage.

- Vibration sensor (KS-3) available [Attach the accessory P4 cord.]
- Set the output voltage manually.
- Set the output frequency automatically.

③ Constant-amplitude and automatic frequency tracking mode (U = 1)

Make the amplitude constant by controlling the output voltage and the frequency.

- Vibration sensor (KS-3) available [Attach the accessory P4 cord.]
- Set the output voltage manually.
- Set the output frequency automatically.
- The resonance frequency is tracked automatically.



Added function

- Set the overflow function timer and the speed switching.



Normal operation

## 9. Default Setting

Before powering ON the Controller, recheck the model, specifications and power voltage of the Controller to confirm no discrepancy, and also recheck the connections to confirm no wrong connection. Particularly when external signal is used, be careful not to make mistake about the polarity.

When the Controller is powered ON, the current software version is shown on the display, then the newest operation pattern as of the powering-OFF time (factory setting when the Controller is used for the first time) is read to the operation memory, and the Controller starts operation in the A mode.

### 1) Setting the adjusting frequency range

Set the frequency range for use in searching for automatic tuning according to your vibrator.

Use the parameter No. 05 for setting.

L: 50 – 180Hz

C: 160 – 280Hz

H: 260 – 400Hz

AL: 50 – 400Hz (factory setting)

Display of factory setting



### 2) Setting the control mode

Use the parameter No. xU for setting.

0: Constant-voltage mode (factory setting)

1: Constant-amplitude and the automatic frequency tracking mode

2: Constant-amplitude mode

※When a multi-speed function is used, set the control mode for all operation patterns to be used.

Display of factory setting



### 3) Setting the vibration sensor

Use the parameter No. xq for setting.

on: Constant-amplitude control using the vibration sensor (factory setting)

off: Constant-amplitude control without using the vibration sensor

The setting is valid when the control mode is the constant-amplitude control mode.

Display of factory setting



### 4) Setting the frequency search

Set whether the vibration sensor should be used or not for the automatic frequency tuning.

Use the parameter No. xr for setting.

on: The vibration sensor is used.

off: The vibration sensor is not used (factory setting).

※When set to off, the automatic frequency tuning is enabled even in the constant-voltage mode.

Display of factory setting



## 10. Adjusting Amplitude

The following description refers to the factory setting with the external control (in1) not in use and the overflow sensor input (in2) in the OFF status.

When adjusting, load a small amount of work in the bowl or chute for use only as a guide to adjustment.

### 1) Setting the frequency in the constant-voltage mode ( $U = 0$ ) manually

#### (1) Power ON the Controller.

Start the Controller in the A mode and normal mode display (output voltage%). (Factory setting: output voltage% = 0.0%)

#### (2) Switch the mode to the n mode.

#### (3) Set the output voltage% by pressing the Vol UP/DOWN keys.

For the first-time adjustment, because the vicinity of the resonance point is searched for, aim at around 30 – 50% to make it easy to find vibration.

#### (4) When the ON/OFF key is pressed, the Controller comes into the forced operation, and starts outputting.

The RUN lamp starts blinking.

#### (5) Press the Freq UP/DOWN keys to display the frequency, and adjust the frequency to make the work runs best.

If the vibration becomes excessive due to approach to the resonance point during this adjustment, lower the output voltage%.

#### (6) Lower the output voltage% until the vibration reduces in intensity to such an extent that the work moves slightly when the Vol UP/DOWN keys are pressed, and adjust the frequency to make the work run best by pressing the Freq UP/DOWN keys.

#### (7) Now, the frequency adjustment is completed.

Set the output voltage% to the required speed by pressing the Vol UP/DOWN keys.

#### (8) Lock the set frequency not to be changed by mistake.

When the Func key is pressed, the F-LOCK lamp starts blinking, and the display shows “off.”

Change “off” to “on” by pressing the Freq UP/DOWN keys, and press the Set key. The F-LOCK lamp lights up, and the frequency is locked.

#### (9) If the Controller is powered OFF in this status, the status before adjustment is resumed. To prevent this, save the adjusted data.

Press the Set key long for over 2 sec. The data display shows “SAVE” in blinking, and shows the normal mode voltage.

#### (10) After the completion of the adjustment, switch the mode to the A mode. This is all for the setting.

※The above frequency adjustment as described in the steps (5) and (6) can also be used for the automatic frequency tuning, which will be described in the following section.

2) In the constant-amplitude (U = 2) and the constant-amplitude and automatic frequency tracking (U = 1) mode

(1) Power ON the Controller.

Start the Controller in the A mode and normal mode display (output voltage%). (Factory setting: output voltage% = 0.0%)

(2) Switch the mode to the n mode.

(3) When the ON/OFF key is pressed, the Controller comes into the forced operation, and starts output.

The RUN lamp starts blinking.

(4) Press the Func key, and press the Freq UP/DOWN keys to display “tuni” on the data display.

(5) Press the Set key long for over 2 sec to start the tuning.

When the Hz lamp and the % lamp are lighting alternately, it means that the tuning is in process. Do not touch the bowl or chute. The information of the vibrator is acquired for use in the constant-amplitude control.

(6) When the alternate lighting of the Hz lamp and % lamp changes to the frequency display, it means that the tuning is over.

(7) Set the output voltage% by pressing the Vol UP/DOWN keys. For the automatic setting of the resonance frequency, target the setting of the output voltage to around 30%.

(8) Press the Func key, and press the Freq UP/DOWN keys to display “Srch” on the data display.

(9) Press the Set key long for over 2 sec to start the automatic frequency tuning.

When the Hz lamp and the % lamp are lighting alternately, it means that the automatic frequency tuning is in process. Do not touch the bowl or chute.

(10) When the alternate lighting of the Hz lamp and % lamp changes to the frequency display, it means that the tuning is over.

Set the output voltage % to the required speed by pressing the Vol UP/DOWN keys.

If the voltage is changed substantially, repeat the above steps (8) and (9) for adjustment.

(11) Save the adjusted data. Press the Set key long for over 2 sec. The data display shows “SAVE” in blinking, and shows the normal mode voltage.

Be sure to take this step in the operation status.

(12) Lock the set frequency not to be changed by mistake.

When the Func key is pressed, the F-LOCK lamp starts blinking, and the display shows “off.”

Change “off” to “on” by pressing the Freq UP/DOWN keys, and press the Set key.

The F-LOCK lamp lights up, and the frequency is locked.

When the amplitude is to be adjusted continuously with another operation pattern, do not perform this operation.

(13) After the completion of the adjustment, switch the mode to the A mode. This is all for the setting.

※1 If the amplitude adjustment is required again after the operation in the A mode, the set voltage upon the switching to the n mode is the output voltage at the time of operation.

In the stop status, switch the A mode to n mode again or re-load the operation pattern.

※2 If the amplitude of the vibrator is too small or the output of the vibration sensor is small, a sensor error may occur. Raise the voltage, and make re-adjustment.

It is advisable to record the final output frequency and output voltage% for the next maintenance.

## 11. Added Function

The power outlet of the Controller is of 24VDC, 160mA. Watch out for the total consumption current of the overflow sensor, solenoid valve, etc. to ensure that it will not exceed the power outlet capacity.

### 1) Soft start and soft stop functions

If the rising time or falling time of the piezo feeder should be adjusted, change the settings of the soft start or soft stop.

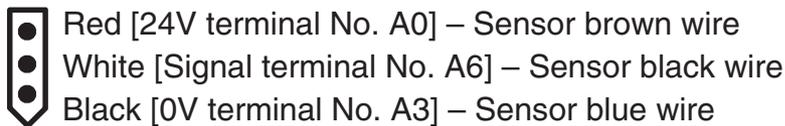
To change the settings, set the relevant parameter accordingly.

The set time range is 0.2 – 9.9 sec. (Default value: 0.2 sec)

### 2) Overflow control [in2 Input] by using the sensor

When the overflow sensor is connected to [in2 Input], the sensor time can be controlled.

The overflow sensor input cable (P3 cord) is connected to [in2 Input]. Connect this cable to the cable terminal connector.



#### (1) Set the sensor timer by setting the parameter.

Parameter No. xA: ON delay = The time until the operation starts after the continuous sensor signal ON status at a stop

Parameter No. xB: OFF delay = The time until the operation stops after the continuous sensor signal OFF status in operation

#### (2) The connection enabled sensor can use the NPN open collector output or the PNP open collector output.

Before connecting the sensor, change the jumper pin settings.

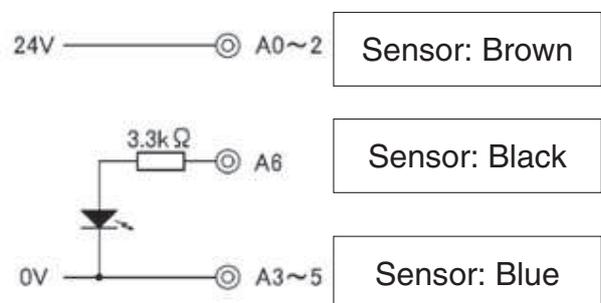
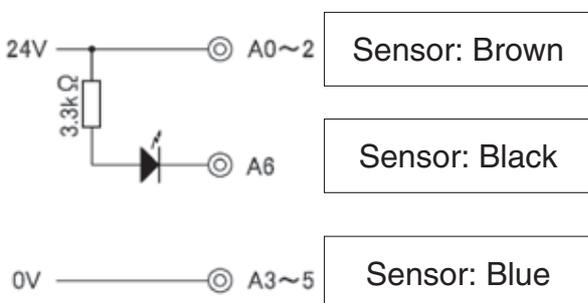
[For NPN]

Jumper pin position:



[For PNP]

Jumper pin position:



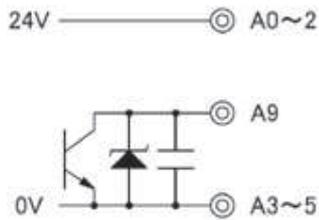
※When the overflow sensor is not used, set the parameter to “Parameter No. 07 = Lo.”

3) External output

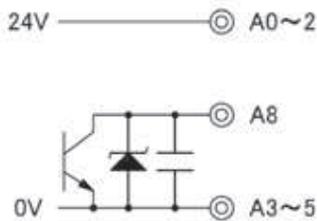
- (1) Operation signal output out1 [Relay contact output 250VAC, 3A]  
Signal synchronous with the vibrator output



- (2) Operation signal output out4 [Open collector output 24VDC, 80mA or less]  
Signal synchronous with the vibrator output

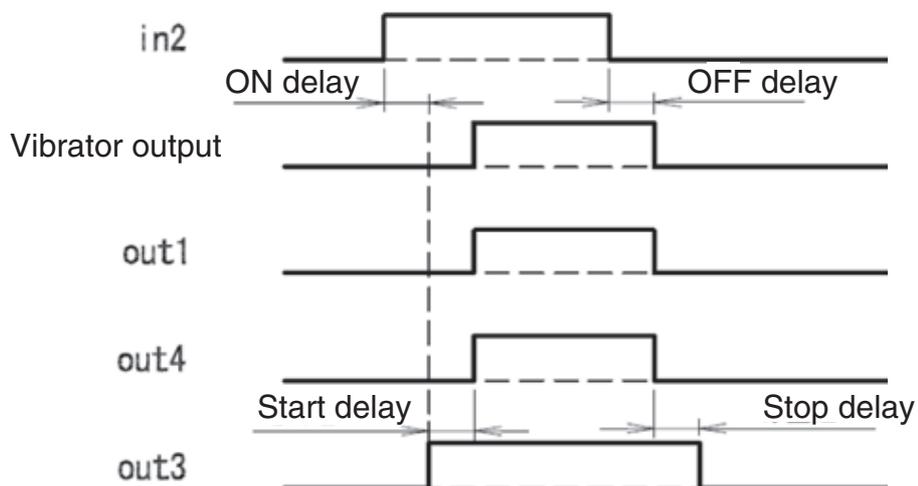


- (3) Operation signal delay output out3 [Open collector output 24VDC, 80mA or less]  
According to the timer settings, ON rises up earlier than the vibrator output, and OFF rises behind the vibrator output.



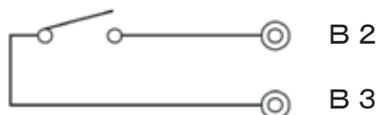
[Time chart]

※When [in1 Input] is the operation condition or the forced operation with the ON/OFF key, the operation is as follows:



- 4) Alarm signal, error signal output out2 [Relay contact output 250VAC, 3A]  
 When the parameter is set to “Parameter No. 08,” the function can be switched to the work shortage signal and error output.

- ①AL = Work shortage signal: Outputted if [in2 input] continues for the set time.
- ②Er = Error signal: Outputted if error stop (e.g., overcurrent error) is caused.



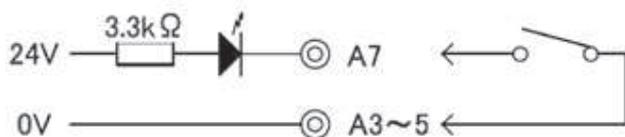
5) Speed switching function

(1) Changing the panel setting operation pattern

- ①When Px (= 1 – 4) is being displayed, press the Set key to display “LoAd.”
- ②Press the Set key again to display “Ld 1.”
- ③Press the Freq UP/DOWN keys to select the operation pattern.
- ④Press the Set key long for over 2 sec. The selected operation pattern is loaded, and the voltage is displayed.

(2) Switching the operation pattern according to the external signal [in3 Input]

- ①Function setting: Set PAT to [out].
- ②Select the operation pattern according to the ON/OFF of [in3 Input].



|           | Operation pattern setting |    |    |    |
|-----------|---------------------------|----|----|----|
|           | P1                        | P2 | P3 | P4 |
| in3 Input | OFF                       | ON | /  | /  |

[Returning to the factory setting]

- (1) When the Controller is in the Power-OFF status, power ON the Controller by pressing the Vol UP key and the Freq DOWN key together. The Controller starts in the initialization mode.
  - (2) Press the Freq UP or Freq Down key to make “99” blink on the data display.
  - (3) In this status, press the Func key and the Set key together long for over 3 sec. All set data are reset.
  - (4) Upon the completion of resetting, the data display shows “99” in lighting.
  - (5) When the Func key is pressed long for over 2 sec, the Controller starts in the factory setting status.
- So is the case with powering OFF and then powering ON the Controller.

※When the above procedure is taken, all set data of parameter, frequency and voltage are cleared.

## 12. Parameter list

| No.       | Function                  | Description  | Setting range   | Default value of each operation pattern |       |       |       |
|-----------|---------------------------|--|---|---|-------|-------|-------|
|           |                           |  |   | 1                                       | 2     | 3     | 4     |
| <b>A</b>  | ON delay timer            | in2 Input ON delay timer   | 0.0-9.9   | 0.0                                     | 0.0   | 0.0   | 0.0   |
| <b>b</b>  | OFF delay timer           | in2 Input OFF delay timer  | 0.0-9.9   | 0.0                                     | 0.0   | 0.0   | 0.0   |
| <b>c</b>  | Soft start                | Output soft start timer  | 0.2-9.9<br>--: Invalid  | 0.2                                     | 0.2   | 0.2   | 0.2   |
| <b>d</b>  | Soft stop                 | Output soft stop timer   | 0.2-9.9<br>--: Invalid  | 0.2                                     | 0.2   | 0.2   | 0.2   |
| <b>E</b>  | Start delay timer         | Output start delay timer   | 0.0-9.9   | 0.0                                     | 0.0   | 0.0   | 0.0   |
| <b>F</b>  | Stop delay timer          | out4 Output stop delay timer   | 0.0-9.9   | 0.0                                     | 0.0   | 0.0   | 0.0   |
| <b>n</b>  | Work shortage timer       | in2 Input work shortage detection  | 0-99  | 30                                      | 30    | 30    | 30    |
| <b>o</b>  | Frequency tracking cycle  | Setting of frequency changing cycle  | 0.1-9.5   | 1.0                                     | 1.0   | 1.0   | 1.0   |
| <b>P</b>  | PI control gain           | Setting of the speed of output response to vibration change when the constant-amplitude control is in process<br>1 (slow) ⇔ 9 (fast) | 1-9   | 9                                       | 9     | 9     | 9     |
| <b>q</b>  | Vibration sensor setting  | Validity/invalidity of the constant-amplitude control sensor   | off/on  | on                                      | on    | on    | on    |
| <b>r</b>  | Search setting            | Validity/invalidity of the automatic frequency tuning sensor   | off/on  | off                                     | off   | off   | off   |
|           | % display                 | Output voltage backup display  |   | 0.0                                     | 0.0   | 0.0   | 0.0   |
|           | Hz display                | Frequency backup display   |   | 240.0                                   | 240.0 | 240.0 | 240.0 |
| <b>05</b> | Adjusting frequency range | Setting of the search range when the automatic frequency tuning is in process  | L: 50-180Hz<br>C: 160-280Hz<br>H: 260-400Hz<br>AL: 50-400Hz                     | AL                                      |       |       |       |
| <b>06</b> | in1 setting               | in1 Input logic  | Hi: Operation with the contact "Close"<br>Lo: Operation with the contact "Open" | Lo                                      |       |       |       |
| <b>07</b> | in2 setting               | in2 Input logic  |   | Hi                                      |       |       |       |
| <b>08</b> | out2 setting              | Setting of out2 Output function  | AL/ER   | AL                                      |       |       |       |
| <b>u</b>  | Amplitude control setting | 0: Constant voltage<br>1: Constant-amplitude and automatic frequency tracking<br>2: Constant-amplitude                               | 0-2   | 0                                       | 0     | 0     | 0     |

Display: 1st digit = Operation patterns 1-4, 2nd digit = Parameter No., 3rd and 4th digits = Set value

### 13. Guard and Alert

#### 1) Error display

If an error occurs, the error No. is displayed on the data display, and the output is stopped forcedly.

Reset the error as described below.

When resetting the error, eliminate the abnormality beforehand.

If the external signal is an operation condition, be careful that the Controller becomes ready for operation upon resetting.

(1) Power OFF the Controller, and the error will be reset.

(2) Press the Vol DOWN key and the Freq DOWN key together long for over 3 sec, and the error will be reset.

#### 2) Alert display

An alert is displayed during operation or adjustment.

The output will not stop.

If the Controller is continuously used as it is, an error may occur. Therefore, review the settings, etc.

| Error No. | Error name               | Contents  |
|-----------|--------------------------|---|
| E-01      | Overcurrent error        | The output is over the maximum output current.      |
| E-02      | Overvoltage error        | The output is over than the maximum output voltage. |
| E-04      | Temperature error        | The temperature inside the controller is too high.  |
| E-08      | Search error             | The automatic frequency tuning failed.              |
| E-09      | Constant-amplitude error | The output current increased abnormally.            |
| E-10      | Parameter error          | Memory error on startup                             |
| E-11      | Operation data error     | Memory error on startup                             |
| E-12      | System data error        | Memory error on startup                             |

| Alert No. | Alert name              | Contents   |
|-----------|-------------------------|--|
| E-81      | Overvoltage alert       | The output voltage is the maximum.                                       |
| E-82      | Overcurrent alert       | The output current is the maximum.                                       |
| E-85      | Sensor error            | The sensor value is below the specified value.                           |
| E-86      | Sensor connection error | The sensor is connected to a wrong vibrator.                             |
| E-87      | Sensor error 2          | The connection between the sensor and the vibrator cannot be recognized. |

## 14. Troubleshooting

| Trouble   | Probable cause   | Corrective action  |
|---|--|--|
| The vibrator does not vibrate.                          | The power cable is not connected.  | Connect the power cable.   |
|   | “Voltage (%)” is “0.0.”  | Set “Voltage(%)”.  |
|   | The set frequency is wrong.  | Adjust the frequency to the resonance frequency.                                     |
|   | The output connectors is disconnected from the vibrator.   | Connect the output connector to the vibrator.  |
|   | The RUN lamp is OFF.   | Check the external control and the overflow sensor.<br>Check the parameter settings. |
|   | The RUN lamp is blinking.  | Press the ON/OFF key   |
| Voltage(%) cannot be set.                               | The AUTO lamp is ON. (The mode is the A mode.)   | Switch the mode to the n mode.   |
| The frequency cannot be adjusted.                       | The AUTO lamp is ON. (The mode is the A mode.)   | Switch the mode to the n mode.   |
|   | The F-LOCK lamp is ON.   | Release the lock.  |
| When the power is turned OFF, the settings are cleared. | The data has not yet been saved.   | Save the data.   |
| The overcurrent error (E-01) is displayed.              | The vibrator is probably abnormal.   | Contact the dealer.  |
|   | Ground fault was caused due to damage to the controller output cable cover or the vibrator wire cover. | Replace the damaged cable or wire.   |
|   | The frequency is deviant.  | Adjust the frequency to the resonance frequency.                                     |

## 15. Options

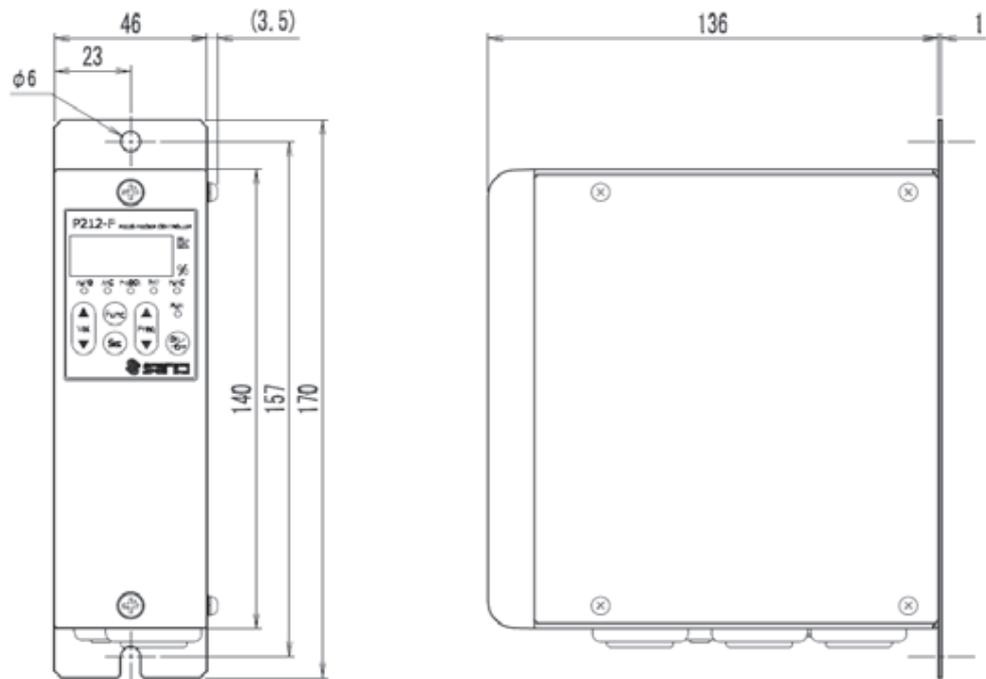
| Name                                   |                              | Length (mm) | Terminal                  |                | Remarks            |
|--|------------------------------|-------------|---------------------------|----------------|--------------------|
| Power cable                            | VCTF 0.75×3                  | 1200        | Nichifu pin terminal male | PC-2005M       | Provided on option |
| Output cable                           | VCTFK 0.75×2                 | 1200        | Molex terminal            | 1189ATL        |                    |
|  |                              |             | Molex housing 3P          | 1396R1         |                    |
| Overflow sensor input cable (P3 cord)  | VCTF 0.3×3                   | 300         | Molex terminal            | 1189ATL        |                    |
|  |                              |             | Molex housing 3P          | 1396R1         |                    |
| Vibration sensor input cable (P4 cord) | MOGAMI 2330 (Low Noise Wire) | 1200        | Molex terminal            | 1189ATL        |                    |
|  |                              |             | Molex housing 2P          | 1545R1         |                    |
| Vibration sensor (KS-3)                | MOGAMI 2330 (Low Noise Wire) | 1000        | Molex terminal            | 1190TL         |                    |
|  |                              |             | Molex housing 2P          | 1545P1         |                    |
| Vibration sensor input extension cable | MOGAMI 2330 (Low Noise Wire) | 2000        | Molex terminal            | 1190TL/1189ATL |                    |
|  |                              |             | Molex housing 2P          | 1545P1/1545R1  |                    |

## 16. Specifications

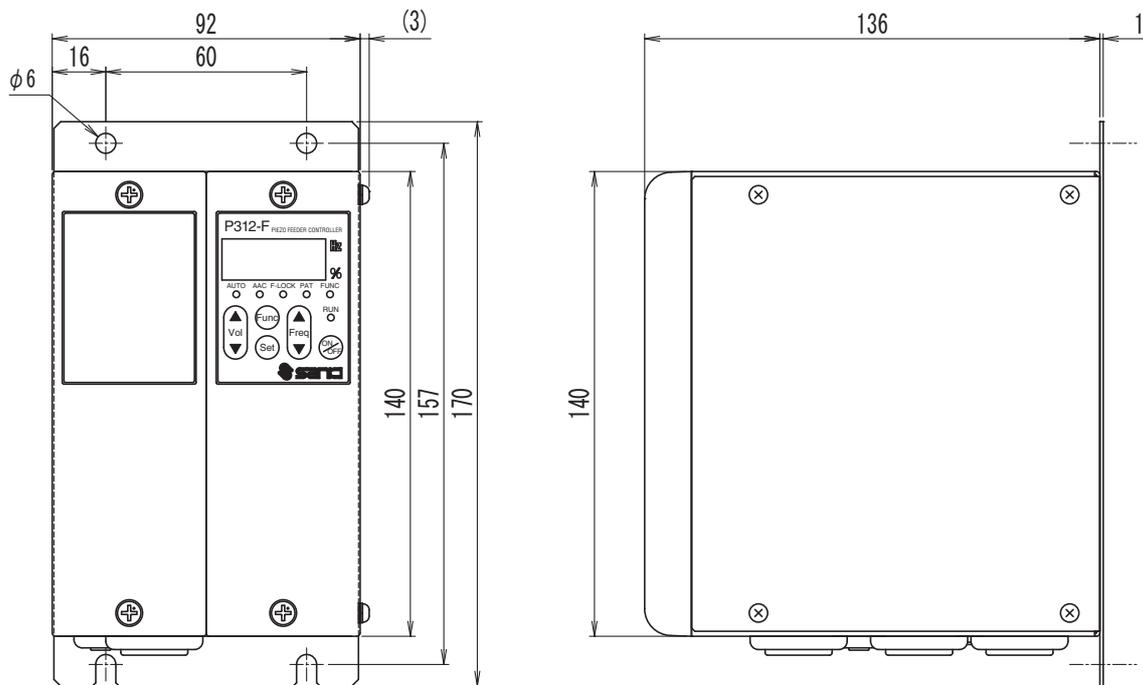
| Model                       |  | P212-F  | P312-F                                  |
|-----------------------------|--|---|---|
| Input                       | Voltage  | 100/230VAC±10%  |   |
|                             | Frequency  | 50/60Hz   |   |
|                             | Number of phases   | Single phase  |   |
| Output                      | Control method   | Sine wave PWM method  |   |
|                             | Maximum current  | 50mA  | 170mA                                   |
|                             | Voltage  | 0 - 240VAC  |   |
|                             | Frequency  | 50 - 400Hz  |   |
| Operation mode              | Constant-voltage mode                                    | Constant-voltage control with the set frequency   |   |
|                             | Constant-amplitude mode                                  | Constant-amplitude control with the set frequency   |   |
|                             | Constant-amplitude and resonance frequency tracking mode | Constant-amplitude control with automatic tracking around the resonance point of the vibrator |   |
| Vibration sensor (option)   |  | KS-3 (used for the constant-amplitude control)  |   |
| Added function              | Operation and stop                                       | Operation and stop enabled according to external signal (contact or 24VDC)                    |   |
|                             | Overflow sensor input                                    | NPN/PNP open collector sensor connection enabled  |   |
|                             | Operation signal output                                  | No-voltage contact and NPN open collector   |   |
|                             | Speed change   | Operation pattern change according to the external signal                                     |   |
|                             | Others   | Automatic frequency tuning, soft start, soft stop, short-circuit protection, etc.             |   |
|                             | Power outlet   | 24VDC, 160mA  |   |
| Operating temperature range |  | 0 - 40°C  |   |
| Operating humidity range    |  | 30 - 90% (no condensation)  |   |
| Place of use                |  | Indoor (no corrosive gas, dust or the like)   |   |
| Noise resistance            |  | 1000Vp or more  |   |
| Incoming capacity           |  | 15VA  | 26VA                                    |
| Mass                        |  | 1.2kg   | 2.4kg                                   |
| Applicable vibrator         | Bowl feeder<br>(Indicated REF- or later model)           | 90A, 120A, 150A<br>110i, 150i   | 190A, 230A, 300A,<br>390B, 460B<br>190i |
|                             | Inline feeder<br>(Indicated REF- or later model)         | L5A, L15A<br>L25A, L60A, L125A<br>L30AG, L75AG, L150AG,<br>L200AG, L250AG                     |   |

## 17. Outside Dimensional Drawing

[P212-F]



[P312-F]



※The input and output cables are omitted.

## 18. Warranty

The warranty shall continue in effect for one year from the date of shipping.  
(However, the warranty period is calculated based on 8-hour operation a day.)

[Warranty conditions]

1. If failure or break is caused to the Controller by any defect in the design, material or workmanship of the Controller in the normal usage in accordance with the precautions described in the Instruction Manual, labels put on the Controller, and others during the warranty period, we shall provide free repair or part replacement.
2. However, even if it is within the warranty period, following cases shall not be covered under our warranty:
  - ① Failure or break caused by a fire, an earthquake, a flood or the like, or unspecified power source (voltage, frequency)
  - ② Failure caused by improper handling or operation
  - ③ Failure caused by handling against the usage, specifications or precautions described in the Instruction Manual
  - ④ Failure or break caused by remodeling, disassembly or the like conducted without our consent

The contents of this Instruction Manual are subject to change for functional improvement without notice.

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