

PIEZO FEEDER CONTROLLER

Instruction Manual

【High-Function Type】

P212-F

P312-F

This Instruction Manual is applicable to Piezo Feeder Controller version 2 and later.
Confirm the version information displayed upon powering ON.

Ver. 2

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.

 DANGER	If the Controller is handled improperly, a dangerous situation could be caused, and the possibility of death or injury is assumed.
 CAUTION	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.

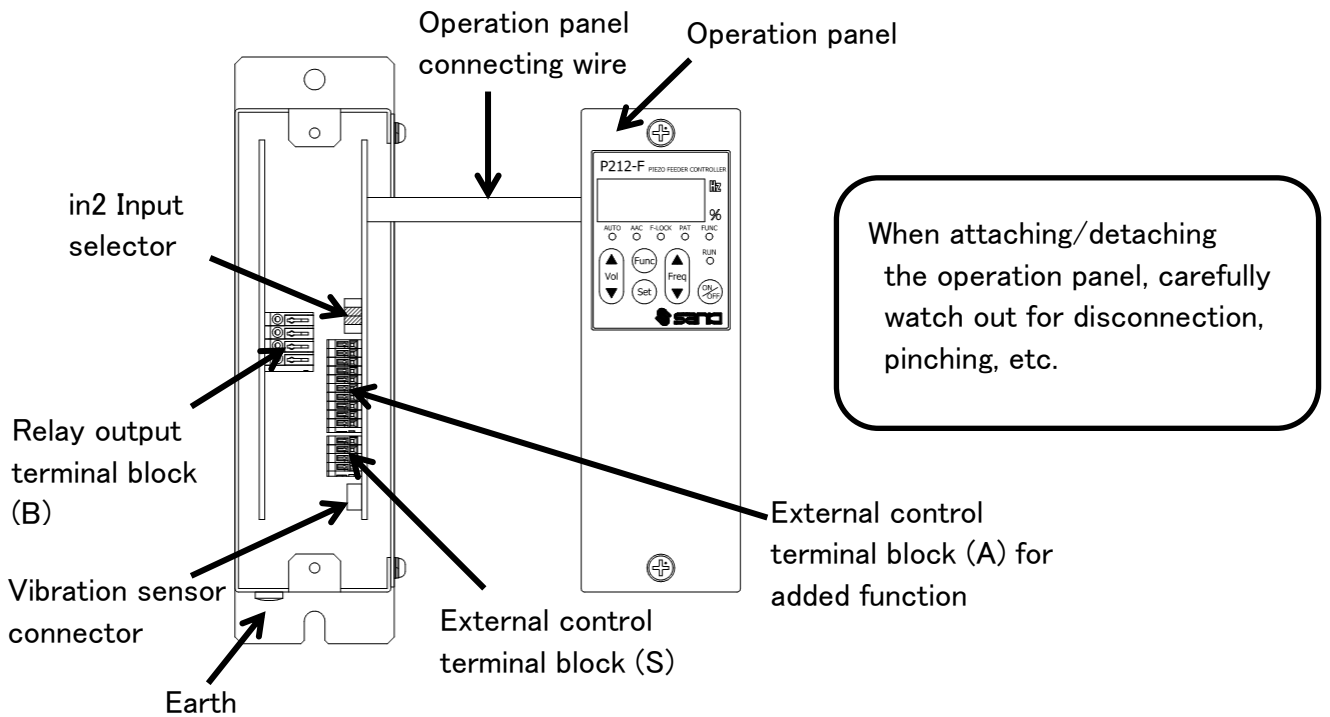
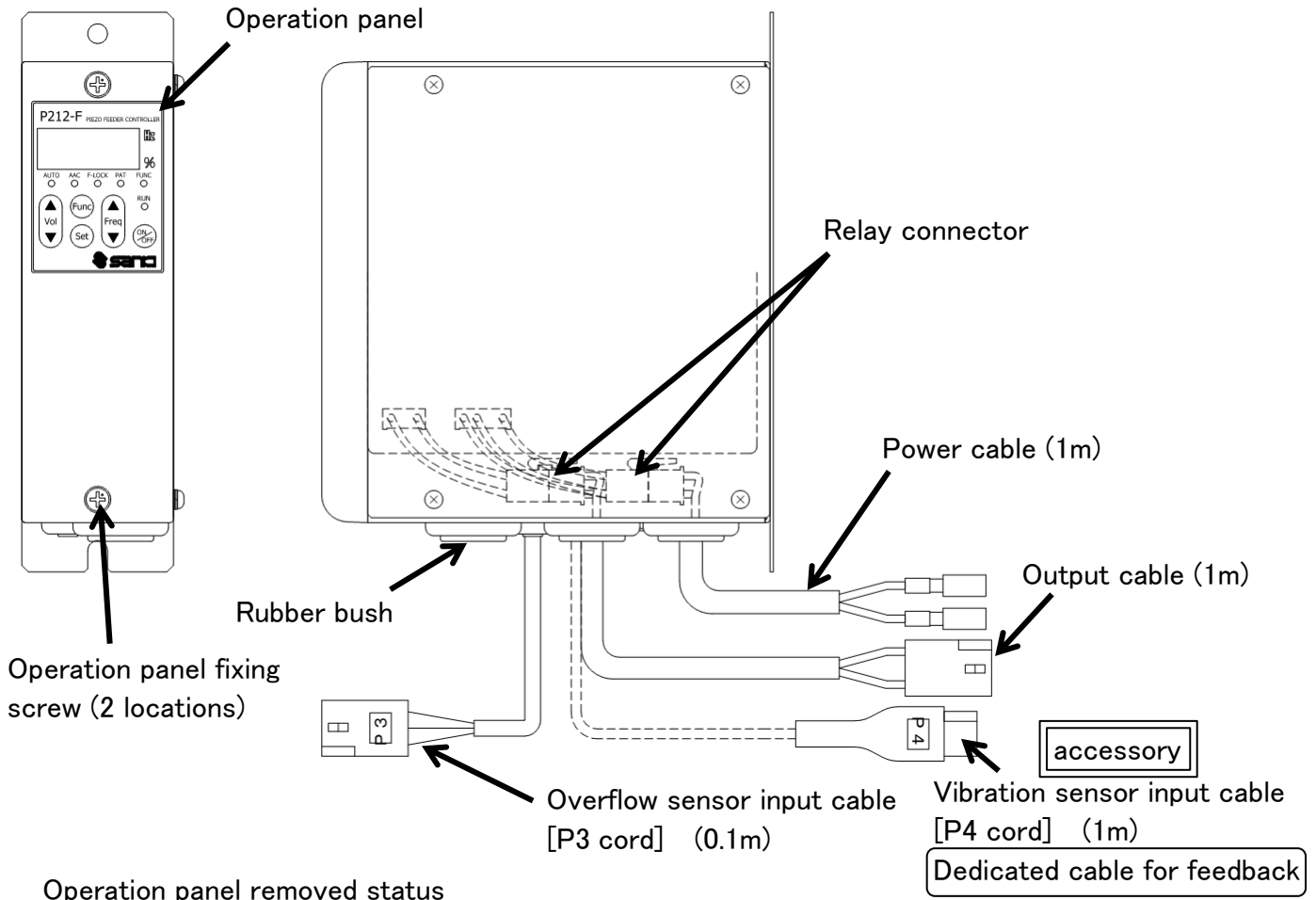
 DANGER

- 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 forcibly 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.

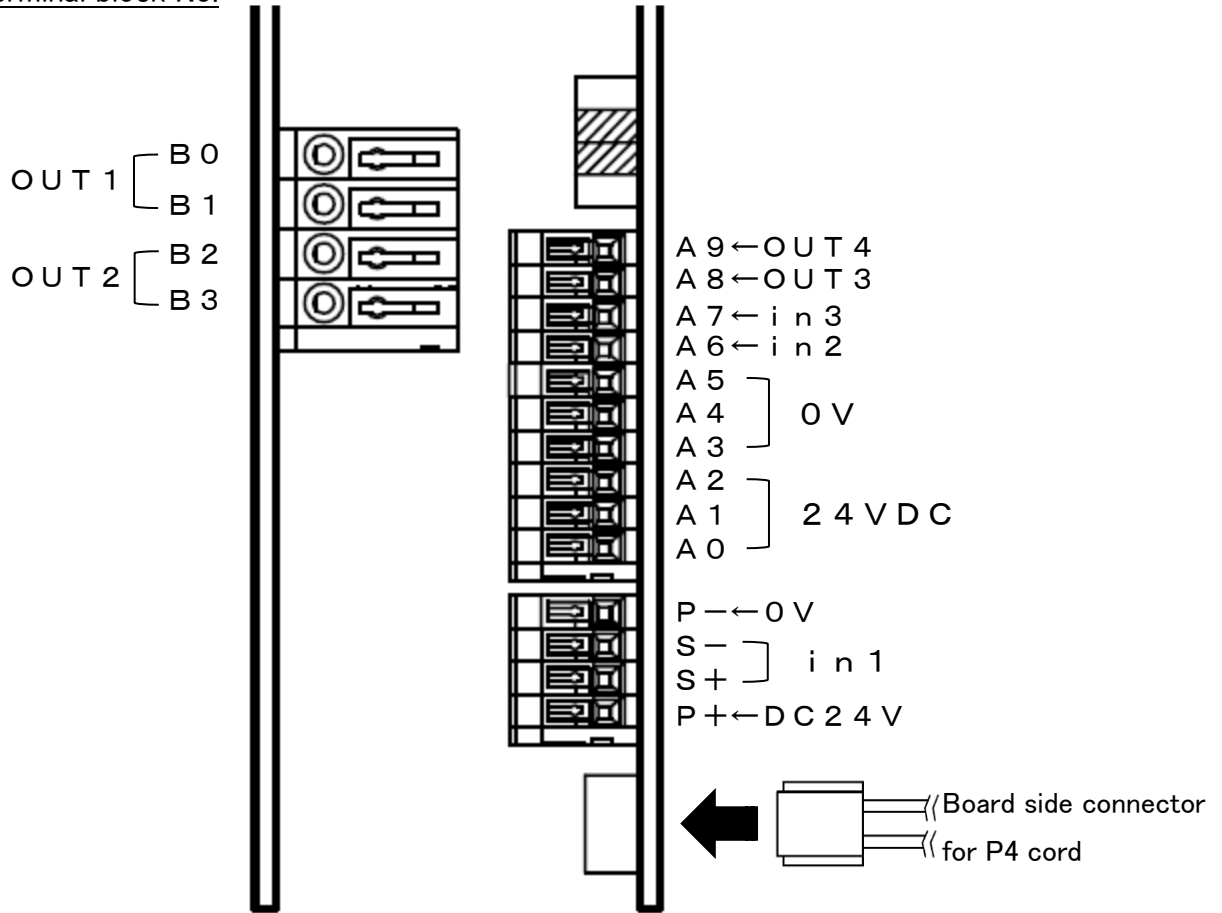
 CAUTION

- 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 feeder side in the Power-ON status.
- Do not perform welding work on the feeder side when the feeder 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 Part

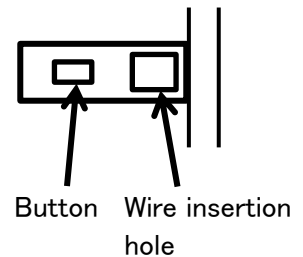


Terminal block No.



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

While holding down the button on the terminal block with a flat-blade screwdriver or similar, 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 – 0.32mm² (AWG28 – 22), Strand diameter: ϕ 0.12mm or more

Solid wire: ϕ 0.32 – 0.65mm (AWG28 – 22)

• Terminal block (B)

Stranded wire: 0.2 – 0.75mm² (AWG24 – 20), Strand diameter: ϕ 0.18mm or more

Solid wire: ϕ 0.4 – 1.2mm (AWG26 – 16)

Wire strip length: 9 – 10mm

5. First-Time Use

Starting operation flow

Input/output connection

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

Default setting

- Make setting according to the vibratory feeder usage.
- Amplitude control, and in1 and in2 input logic

Amplitude adjustment

Adjust the amplitude to optimize the parts transfer speed.

① Constant-voltage mode ($0u = 0$)

Outputs the setting (output voltage, frequency) for a certain length of time.

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

② Constant-amplitude mode ($0u = 2$)

Make the amplitude constant by controlling the output voltage.

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

③ Constant-amplitude and automatic frequency tracking mode ($0u = 1$)

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

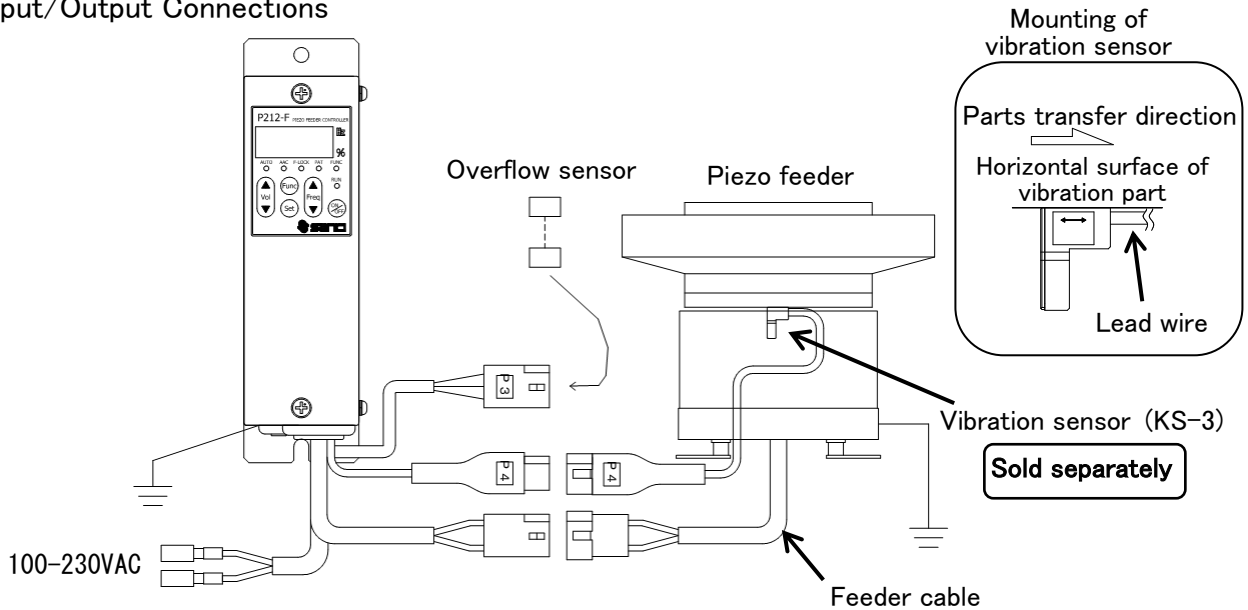
- Vibration sensor (KS-3) necessary [Attach the accessory P4 cord.]
- Set the output voltage manually.
- Set the output frequency automatically.
- The resonance frequency is tracked automatically.

Added function

- Set the timer for soft start, sensor input and solenoid valve output.

Normal operation

6. Input/Output Connections

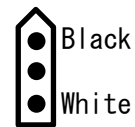


1) Vibratory feeder drive connection

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

The connector wire colors should be identified as follows:

- ※1: Do not connect any feeder other than the piezo feeder made by Sanki.
- ※2: Do not operate with no load.
- ※3: Be sure to ground the feeder.



2) Power source connection

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 connect to the utility power source.
- ※2: Be sure to ground the controller.
- ※3: Do not perform the ON/OFF control on the input power supply side.

3) Vibration sensor connection

Connect the vibration sensor to perform constant amplitude control.

(1) Mounting of vibration sensor

Fix the vibration sensor (sold separately) onto the top of the vibrating body of the feeder or the horizontal surface of the vibration part of the bowl chute or the like (in such a way that the arrow printed on the sensor looks horizontal) with M4 bolt. In mounting the vibration sensor, be careful not to allow the vibration sensor body and the feeder cable to interfere with other parts. In determining the mounting direction of the vibration sensor, it should be noted that the lead wire side of the vibration sensor corresponds to the parts transfer direction.

(2) Connection of the vibration sensor

Firmly connect one end of the input cable (P4 cord, accessory) of the vibration sensor to the connector on the board and connect the other end of the same to the vibration sensor (KS-3).

※1. 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.

※2. Limit the total length of the cable between the controller and the feeder (vibration sensor) to 4m.

To extend the cable, be sure to use the dedicated cable of our make.

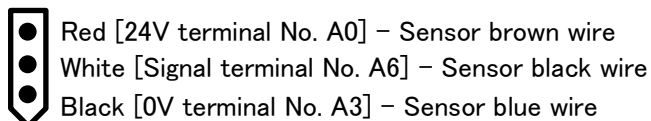
In wiring each cable, detach the wiring from the power cable.

4) Overflow sensor connection

Connect the overflow sensor to the terminal of the overflow sensor input cable (P3 cord). The connection enabled sensor can use the NPN open collector output or the PNP open collector output.

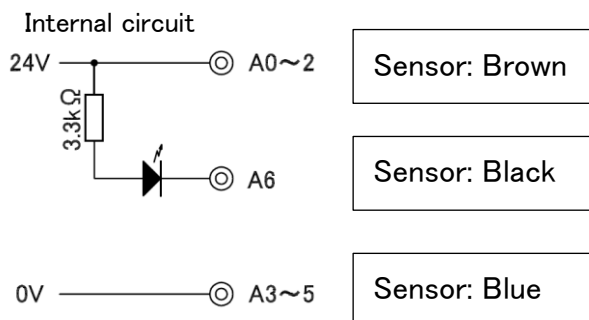
Before connecting the sensor, change the jumper pin settings.

[Terminal connector signal name of P3 cord]



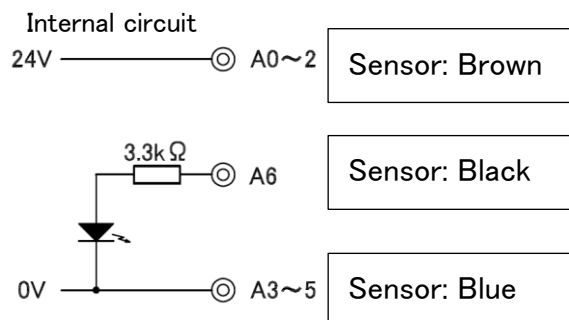
[For NPN]

Jumper pin position:



[For PNP]

Jumper pin position:



- ※1. The input cable (P3 cord) of the overflow sensor is connected to the terminal block [in2 Input].
- ※2. When the overflow sensor is not connected, set as “Parameter No. 07=Lo.”
- ※3. 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.

5) External signal [in1 Input] connection

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

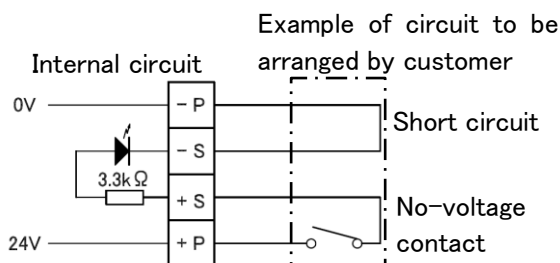
- ※1. To connect the external signal, the operation panel should be removed.
 Confirm that the power supply is in the OFF status. Then, detach the operation panel.
 After the connection is completed, attach the operation panel, and then turn ON the power supply.
 The operation panel is connected to the 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.

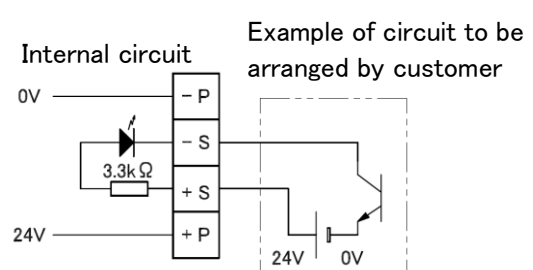
Make connection to the external control terminal block by using the method ① or ② below while watching out for the signal to be used and the connection method. When wiring, be careful not to make mistake about the polarity.

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]]

①When [in1] is in the operating condition, [in2] is enabled.

②When both [in1] and [in2] are in the operating condition, the feeder starts operation.

	Signal input status		Feeder operation condition	
			Setting: hi	Setting: Lo
in1 Input Parameter No. 6	Connection ①: Close	Connection ②: 24VDC	Operation condition	<input type="checkbox"/> Stop
	Connection ①: Open	Connection ②: 0V	Stop	<input type="checkbox"/> Operation condition
in2 Input Parameter No. 7	Sensor signal: O N		<input type="checkbox"/> Operation condition	Stop
	Sensor signal: OFF		<input type="checkbox"/> Stop	Operation condition

: Default

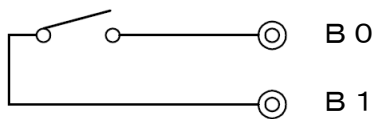
6) External output

This section describes the internal circuits and functions of each output.

For the time chart of each motion, refer to P. 28.

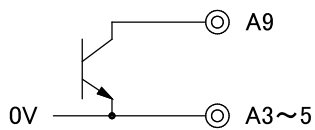
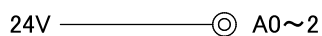
(1) Operation signal output out1 [Relay contact output 250VAC, 3A]

Signal synchronous with the feeder output



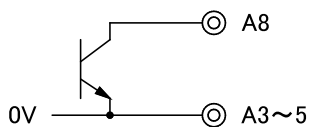
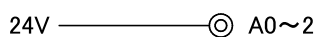
(2) Operation signal output out4 [Open collector output 24VDC, 80mA or less]

Signal synchronous with the feeder output



(3) Operation signal delay output out3 [Open collector output 24VDC, 80mA or less]

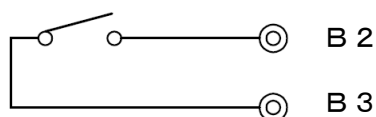
According to the timer settings, ON rises up earlier than the feeder output, and OFF rises behind the feeder output.



(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 parts shortage signal and error output.

- ①AL = Parts shortage signal: Outputted if [in2 input] continues for the set time (Parameter No. 0n).
- ②Er = Error signal: Outputted if error stop (e.g., overcurrent error) is caused.



※1. 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.

7) Speed switching function

(1) About the speed switching function

This Controller can save up to 4 operation patterns (voltage, frequency, vibration quantity).

The operation pattern is switched according to the external signal.

Depending on the “io” mode, the number of operation patterns and the external signal input conditions vary.

For the “io” mode setting method, refer to P. 27.

(2) About the operation pattern, the operation mode and the external signal logic

● Operation pattern switching method for each operation mode

① “A” mode

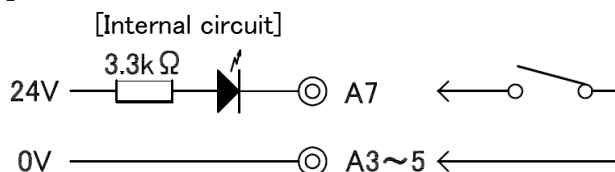
Turn ON/OFF the external signals [in3 Input] and [in2 Input].

② “n” mode

a) Turn ON/OFF the external signals [in3 Input] and [in2 Input].

b) Switch to P1/P2/P3/P4 in the panel setting.

[in3 Input]



[in2 Input]

Refer to P. 8.

● For the relations among the operation pattern for each “io” mode, the operation mode (“A” mode, “n” mode) and the external signal logic, refer to the tables (a), (b) and (c) on the following page.

(a) For io01 and io02

Operation mode	A				n			
Operation patten No.	1	2	3	4	1	2	3	4
Display according to external signal	out1	out2	/	/	out1	out2	/	/
Display according to panel setting	Invalid	Invalid	Invalid	Invalid	P1	P2	P3	P4
in3 input status	OFF	ON	/	/	OFF	ON	/	/

※The display of P3 and P4 according to the panel setting cannot be switched according to the external signal.

(b) For io03

Operation mode	A				n			
Operation patten No.	1	2	3	4	1	2	3	4
Display according to external signal	out1	out2	out3	out4	out1	out2	out3	out4
Display according to panel setting	Invalid	Invalid	Invalid	Invalid	P1	P2	P3	P4
in2 input status	ON	ON	OFF	OFF	ON	ON	OFF	OFF
in3 input status	OFF	ON	OFF	ON	OFF	ON	OFF	ON

(c) For io04

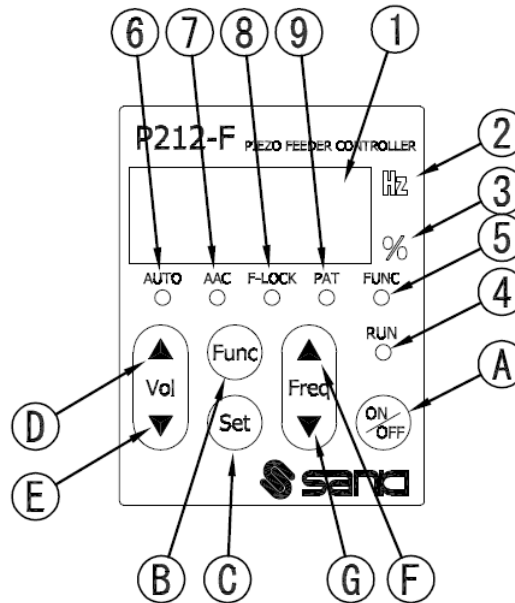
Operation mode	A				n			
Operation patten No.	1	2	3	4	1	2	3	4
Display according to external signal	out1	out2	out3	out4	out1	out2	out3	out4
Display according to panel setting	Invalid	Invalid	Invalid	Invalid	P1	P2	P3	P4
in2 input status	OFF	OFF	ON	ON	OFF	OFF	ON	ON
in3 input status	OFF	ON	OFF	ON	OFF	ON	OFF	ON

(3) Amplitude adjustment method for each operation pattern

- ① The amplitude is adjusted in the “n” mode.
- ② When the Func key is pressed 3 times, the PAT lamp blinks, displaying [out1].
- ③ Each time the Freq▲ key is pressed, the display changes in order of “P1” → “P2” → “P3” → “P4” → “out1.” When the Freq▼ key is pressed, the display changes in the reverse order of the above.
- ④ Press the Set key when “P2” is in display (to adjust the amplitude in the operation pattern 2).
 - ※ To switch the operation pattern to No. 2 according to the external signal, press the Set key when “out1” is in display to turn [in3 Input] into the ON status.
- ⑤ The PAT lamp lights up, and the voltage% is displayed.
- ⑥ Adjust the amplitude by referring to “8. Operation and Amplitude Adjustment Method.”
- ⑦ After the amplitude adjustment for all patterns to be used is completed, start the operation in the “A” mode. In the “A” mode, the setting is forced to be switched to the external signal.

7. Explanation of Operation Panel

7-1. Explanation of Operation Panel



1) Pilot lamps

No	Name	Function
①	Data display	A 7-segment, 4-digit LED Displays voltage, frequency, each settings and error codes.
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. ON: The Controller is in operation under external control. Blinking: The Controller is in forced operation by the ON/OFF key. Long OFF and blinking: The Controller is at a forced stop by the ON/OFF key.
⑤	Parameter mode pilot lamp	ON: The parameter setting is in process. Blinking: The speed magnification change setting is in process (only for 0u:1, 2 in the "A" mode).
⑥	Operation mode pilot lamp	ON: "A" mode (operation) OFF: "n" mode (adjustment) Blinking: The function setting selection is in process.
⑦	Constant-amplitude control pilot lamp	"n" mode: OFF (Constant-voltage control) "A" mode: The constant amplitude setting is displayed. *1
⑧	Frequency lock pilot lamp	"n" mode: ON; The frequency is locked. OFF; The frequency lock is released. Blinking; The function setting selection is in process. "A" mode: Indicates the fixed frequency setting and the automatic frequency tracking setting. *1
⑨	Operation pattern setting pilot lamp	ON: Panel setting (only for setting in the "n" mode) OFF: External signal setting Blinking: The function setting selection is in process.

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

Control setting	Parameter q =on(Use sensor)				Parameter q =oF (Don't use sensors)			
	F-LOCK =oFF		F-LOCK =on		F-LOCK =oFF		F-LOCK =on	
	AAC	F-LOCK	AAC	F-LOCK	AAC	F-LOCK	AAC	F-LOCK
0u: 0	○	○	○	●	○	○	○	●
0u: 1	●	⊗	●	⊗	●	⊗	●	⊗
0u: 2	●	○	●	●	●	○	●	●

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

2) Operation keys

No	Name	Description
A	ON/OFF key	Performs forced operation and forced stopping.
B	Func key	Brief pressing: Switches the function setting. Long pressing: Switches the mode between the parameter mode and the normal mode.
C	Set key	Brief pressing: Changes and locks the data. Long pressing: Saves the data (voltage, frequency, vibration quantity). Starts the searching and tuning of the frequency.
D	Vol ▲ key	Normal mode: When pressed briefly when the frequency is being displayed, the frequency display switches to the voltage display. “A” mode; The voltage cannot be changed. When the magnification change setting is uLoc, the speed magnification can be changed. “n” mode; Adjusts the output voltage. Parameter mode: Selects the parameter No.
E	Vol ▼ key	
F	Freq ▲ key	Normal mode: When pressed briefly when the voltage is being displayed, the voltage display switches to the frequency display. “A” mode; The frequency cannot be changed. “n” mode; Adjusts the frequency. Function setting is in display: Each function setting can be changed. Parameter mode: Changes the parameter data.
G	Freq ▼ key	

*Long pressing: Continually press the key for 2 sec.

7-2. Display Mode

1) Normal mode

Displays and sets the output voltage, the frequency and the function setting on the data display area.

Upon turning ON the power supply, this display appears.

A mode ⇒ Displays the output voltage and the frequency, and displays and sets the function setting.

n mode ⇒ Displays and sets the output voltage and the frequency, and saves their data. Displays and sets the function setting.

2) Parameter mode (Pilot lamp ⑤FUNC is ON.)

Shows and sets the parameter on the data display. (Details⇒P.30)

Depending on the operation mode, the parameter that can be set is differing.

A mode ⇒ Displays and sets the parameter that needs to be changed during operation.

n mode ⇒ Displays and sets all parameters.

To switch the display mode, press the Func key long for 2 sec.

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

7-3. Setting the Function

This operation can be performed when the normal mode (output voltage, frequency) is in display. Each time the Func key is pressed, the pilot lamps ⑤—⑨ blink sequentially, and each function setting item is displayed on the data display area. The function setting to be displayed when the Func key is pressed is differing according to the operation mode and the amplitude control setting as follows:

(a) “A” mode (for the setting other than the setting of (b))

Voltage (Frequency) → ⑥AUTO → ⑨PAT → Voltage

(b) “A” mode (only for setting of 0u:1, 2 and 0L:oF)

Voltage (Frequency) → ⑥AUTO → ⑨PAT → ⑤FUNC → Voltage

(c) “n” mode

Voltage (Frequency) → ⑥AUTO → ⑧FLOCK → ⑨PAT → Voltage

To select the setting, press the Freq▲ key or Freq▼ key. To execute the setting change, press the Set key.

When the setting change is completed, the voltage is displayed.

If the process is brought forward to the next item by pressing the Func key without pressing the Set key during the setting change, the setting will not be changed.

※If there is no key operation for over 5 min, the voltage is displayed.

(1) AUTO : Selects the operation mode.

Data display	Mode	Function
A	A mode (operation mode)	The feeder operates according to each operation pattern settings. The feeder operates according to the amplitude control setting (0u setting). The voltage and the frequency themselves cannot be changed.
n	n mode (adjustment mode)	The feeder operates according to each operation pattern setting or panel setting. The feeder operates with VVVF. Sets the voltage frequency, and adjusts the amplitude.
Srch	Automatic frequency tuning	Searches the resonance frequency at the set voltage %.
tuni	Tuning	Searches the feeder characteristics at the voltage 30% output.

(2) F-LOCK : Sets the frequency lock

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

(3) PAT : Switches the operation pattern.

Px (x=1—4): Displays the panel setting. (Setting is enabled only in the “n” mode.)

Outx (x=1—4): Displays the operation pattern of the external signal status.

Depending on the “io” mode setting, the switchable operation pattern is differing.

(a) io01 or io02: Status of the external signal in3 (patterns 1—2)

(b) io03 or io04: Status of the external signals in2 and in3 (patterns 1—4)

(4) FUNC : Locks/unlocks the magnification change setting.

“A” mode: Enabled and displays only in the amplitude control setting (0u: 1, 2) and the remote unit setting (0L: oF).

Loc: Locks. (The speed magnification cannot be changed. Displays “Γ” in the decimal point section of the voltage setting.)

uLoc: Unlocks. (The speed magnification can be changed. Displays the value of the decimal places of the voltage setting.)

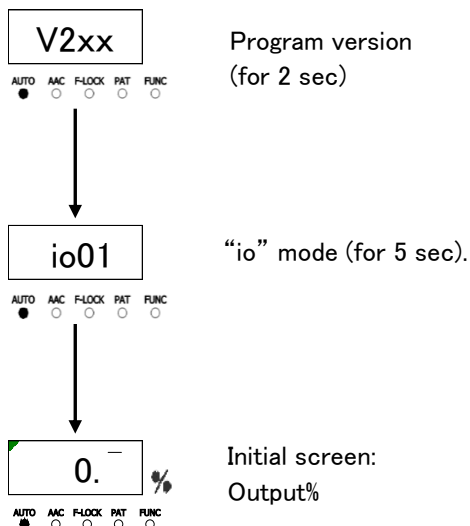
7-4. Preparation for Operation

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 mistake the polarity.

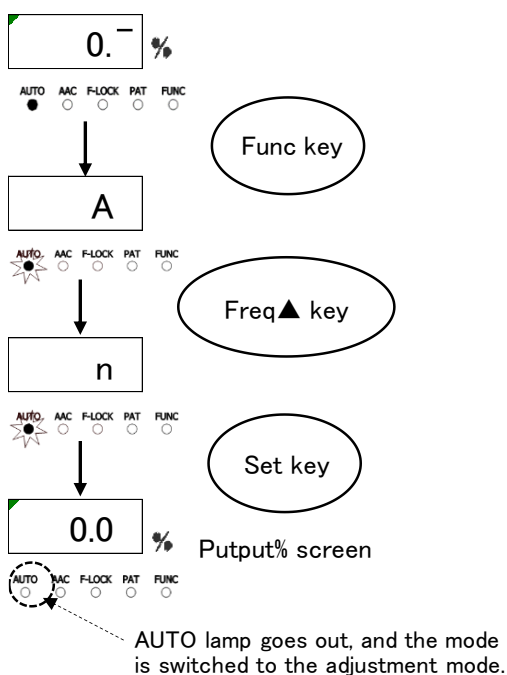
8. Operation and Amplitude Adjustment Method

① Power ON

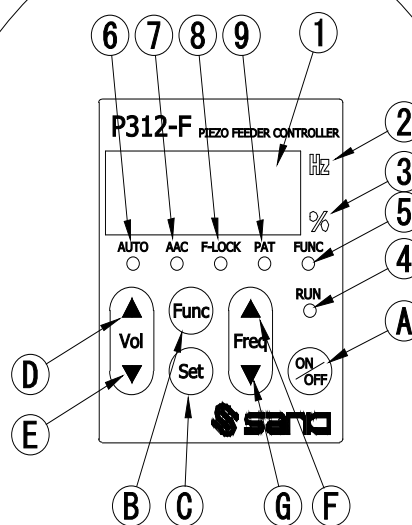
The following are displayed in this order:



② Switching from the operation mode to the adjustment mode



Operation panel



<Lamp status>

● : ON ✨ : Blinking ○ : OFF

- ① Data display area (A) ON/OFF key
- ② Frequency pilot lamp (B) Func key
- ③ Voltage% pilot lamp (C) Set key
- ④ Operation pilot lamp (D) Vol▲ key
- ⑤ Parameter pilot lamp (E) Vol▼ key
- ⑥ Operation mode pilot lamp (F) Freq▲ key
- ⑦ Constant amplitude control pilot lamp (G) Freq▼ key
- ⑧ Frequency lock pilot lamp
- ⑨ Operation pattern setting

<Meaning of display contents>

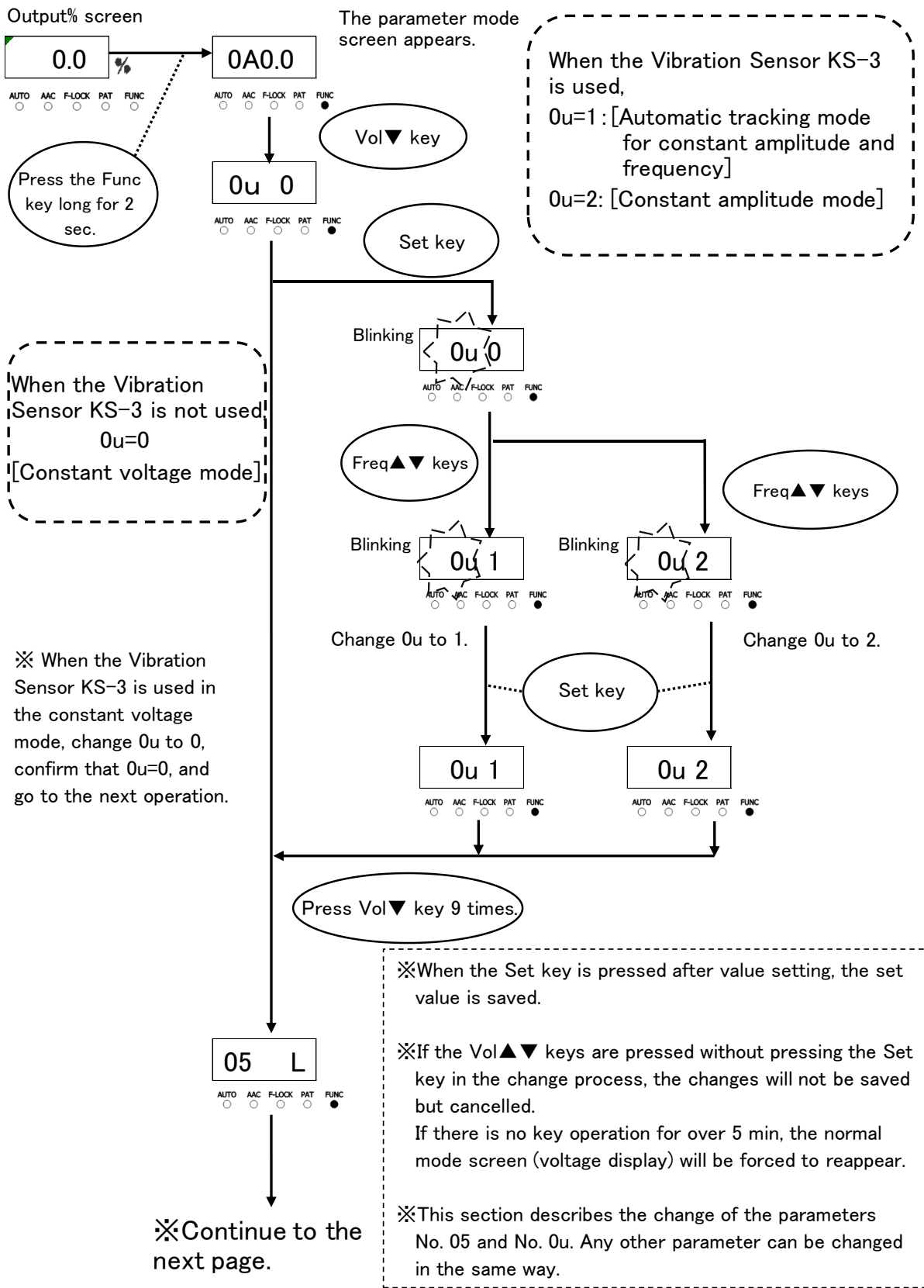
“A”: Switching to the “A” mode
 “n”: Switching to the “n” mode
 “Srsh”: Frequency search
 “Euni”: Tuning

<Adjustment mode>

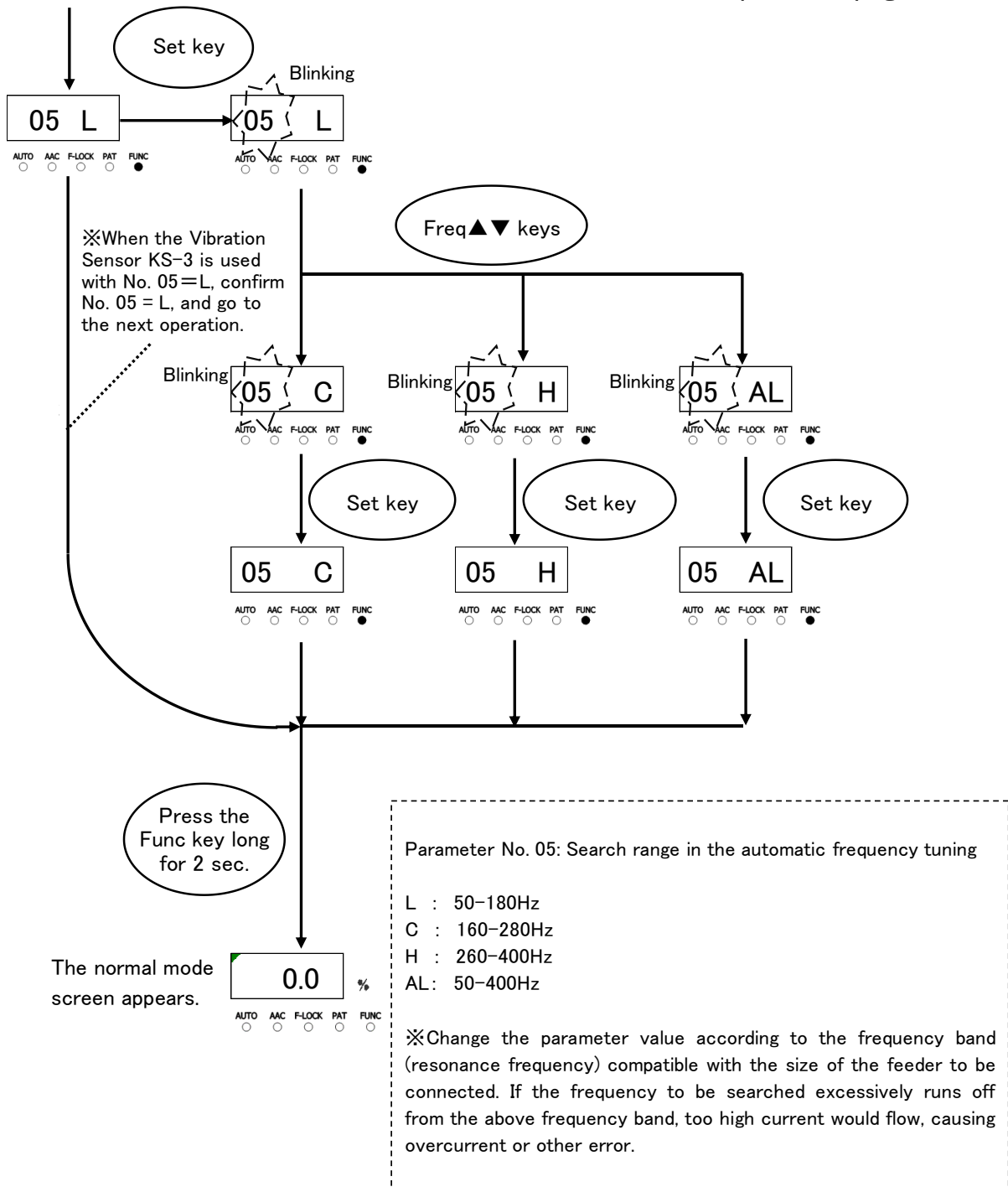
⇒ In this mode, the frequency and the output% can be adjusted, and all parameters can be set and changed.

※ Next, go to <③ Parameter setting>.

③ Parameter setting

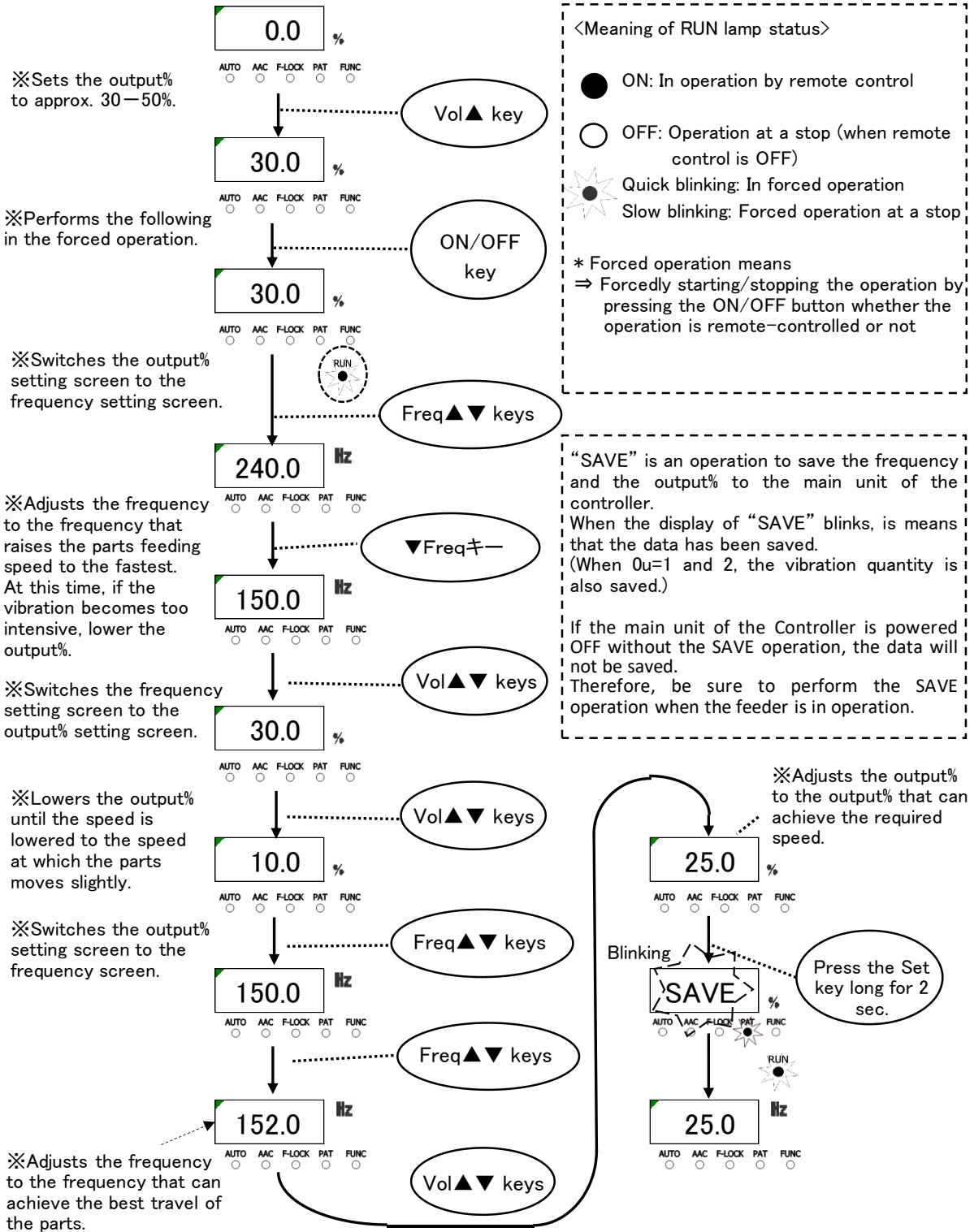


※Continued from the previous page.



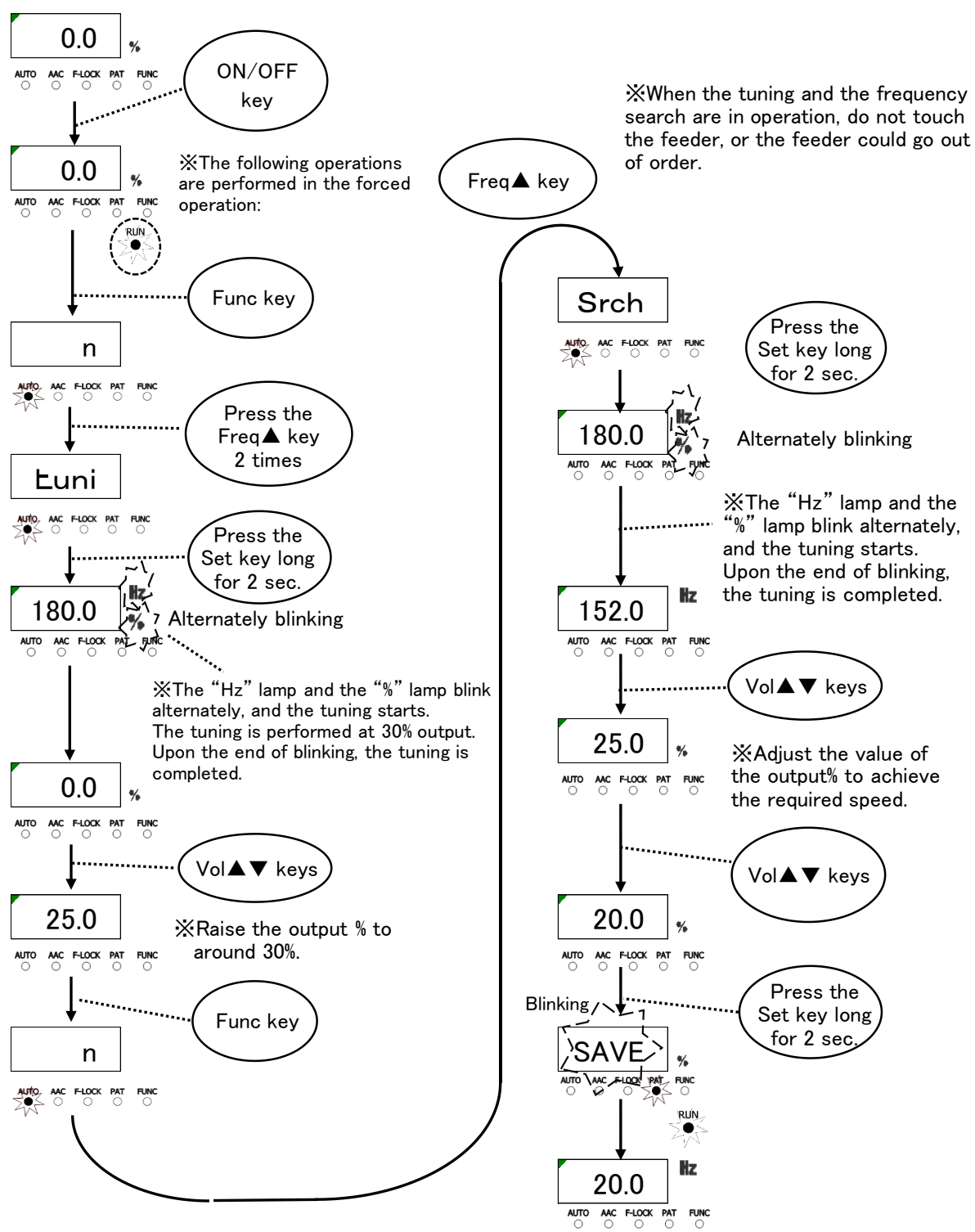
※When the Vibration Sensor KS-3 is not used, go to ④-A.
 When the Vibration Sensor KS-3 is used, go to ④-B.

④-A: When the Vibration Sensor KS-3 is not used (0u=0)



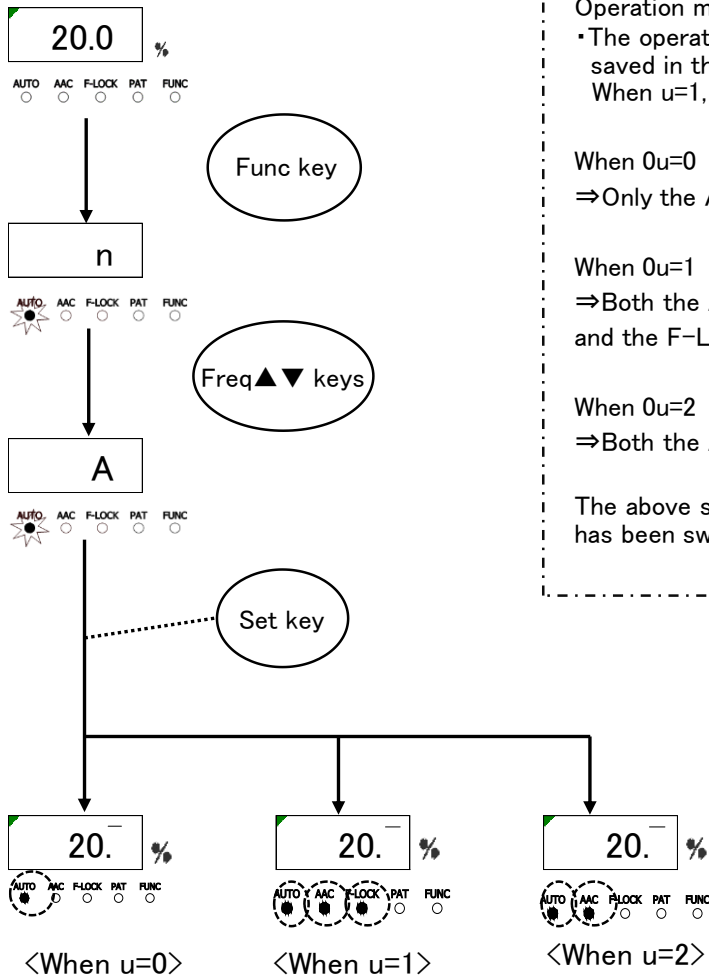
※Go to <⑤Switching from the adjustment mode to the operation mode>.

④-B When the Vibration Sensor KS-3 is used
 (When the feedback control is performed in the constant amplitude mode, 0u=1, 2)



※Go to <⑤ Switching from the adjustment mode to the operation mode>.

⑤ Switching from the adjustment mode to the operation mode
(common operation after ④-A and ④-B)



Operation mode

• The operation is performed based on the value saved in the adjustment mode.
When $u=1, 2$, the feedback control is performed.

When $0u=0$

⇒ Only the AUTO lamp lights up.

When $0u=1$

⇒ Both the AUTO lamp and the AAC lamp light up, and the F-LOCK blinks.

When $0u=2$

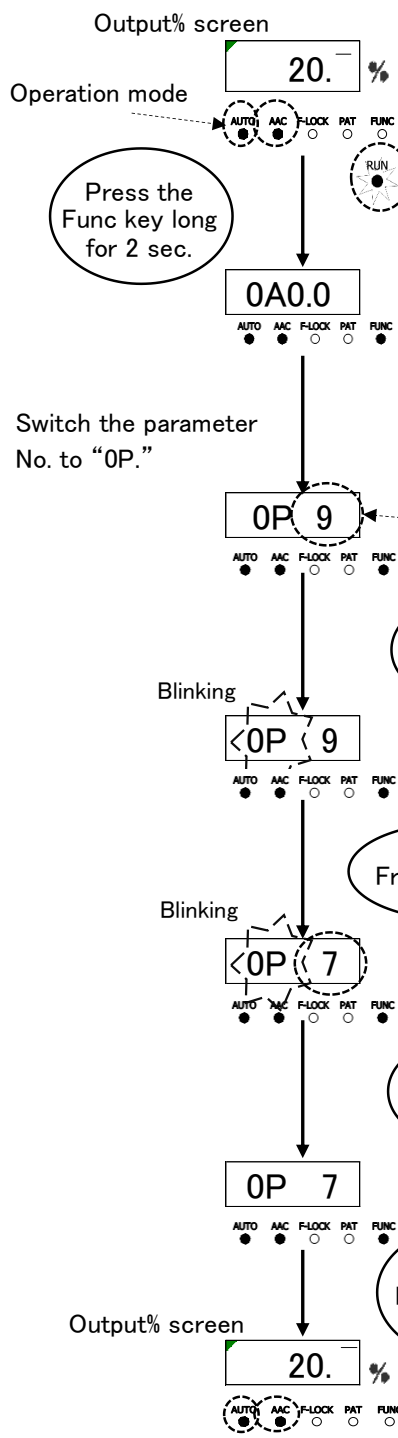
⇒ Both the AUTO lamp and the AAC lamp light up.

The above status of lamps indicates that the mode has been switched to the operation mode.

✂ Now, the vibration adjustment is completed.

⑥ Exceptional case: When the feedback control fails

⑥-A Adjustment of the feedback gain (PI control gain)

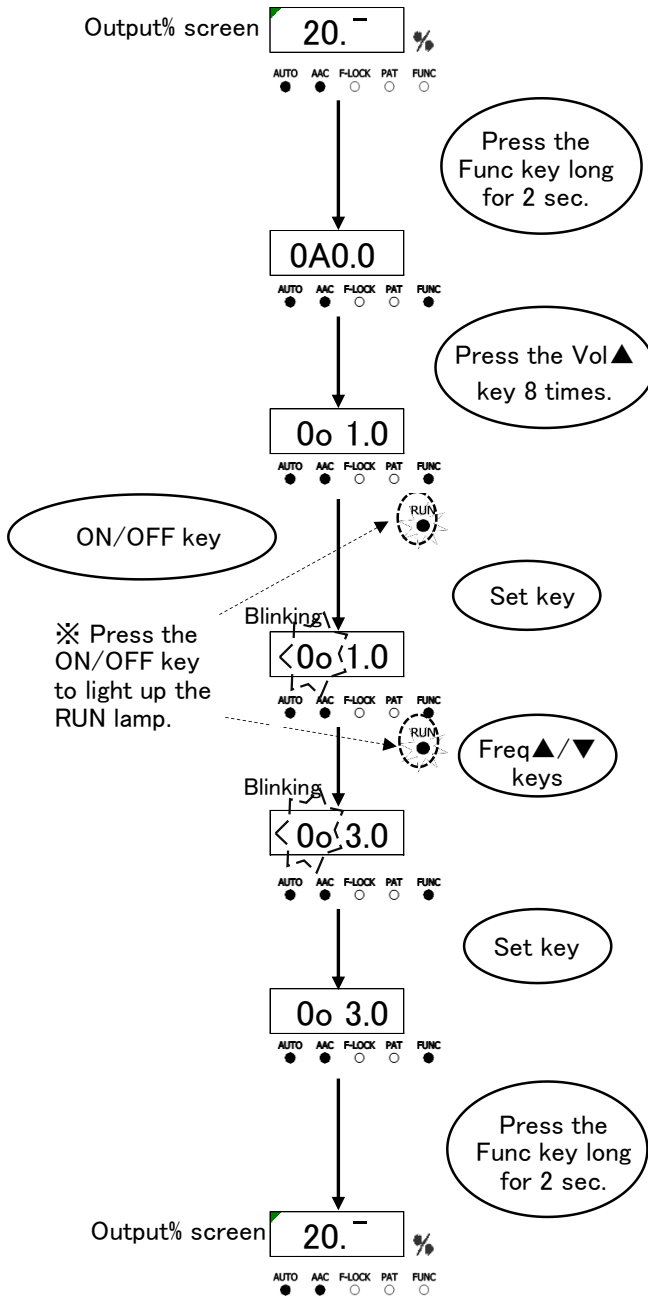


The operation described in this section is performed if the speed variation repeats pulsating (becoming faster and slower).
Adjust the output reaction to the vibration sensor signal.
Perform this operation when the feeder is in operation.

※Change this value to change the reaction speed.

※The value can be changed within a range of 1—9.
The smaller the value is, the slower the reaction is. The larger the value is, the faster the reaction is.
※<If the start is slow>
If the slow start is not improved even if the number of seconds of the parameter No. 0C (soft start) is made smaller, raise the value of the parameter No. 0P (reaction speed), and the slow start may be improved.

⑥-B Adjustment of the automatic frequency tracking time in the feedback control (only when $0u=1$)



The operation described in this section is performed to change the automatic frequency tracking time interval.

Perform this operation if the reaction speed of the feedback control is too fast or too slow and, as a result, the parts transfer is unstable.

Perform this operation when the feeder is in operation.

Adjust the parameter $0u$ value while actually watching the parts behavior. Perform this operation slowly to carefully watch the parts behavior.

If no improvement is seen, change the parameter value again for adjustment.

9. Added Function

9-1. 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.

Parameter No. 0C: Soft start = The time until the set output is achieved after the operation starts

Parameter No. 0d: Soft stop = The time until the stop is made from the set output after the stop conditions are met.

The set time is 0.2—9.9 sec. (The default value is invalid.)

9-2. Overflow Sensor Timer Function

The timer of the overflow sensor [in2 Input] is set in the parameter setting as follows:

Parameter No. 0A: ON delay = The time until the operation starts after the continuous sensor signal ON status at a stop

Parameter No. 0b: OFF delay = The time until the operation stops after the continuous sensor signal OFF status in operation

9-3. Operation Signal Delay Output Timer Function

The motion of the operation signal delay output OUT3 can be delayed from the timing of the feeder output.

Parameter No. 0E: Start delay = The time until the OUT3 becomes ON and the feeder starts outputting after the feeder output meets the operation conditions

Parameter No. 0F: Stop delay = The time when OUT3 remains ON after the feeder stops outputting

10. “io” Mode Setting Function

This Controller can switch the control target of [in2 Input].

The functions that the “io” mode setting can perform:

- ① Switching of the “io” mode
- ② Initialization of the set data [Reset to the factory setting]

Function	Control target
io01	Controls the feeder output in [in2 Input]. [with overflow stop] (factory setting)
io02	Does not control the feeder output in [in2 Input]. [without overflow stop]
io03	[in2 Input] is pattern switching input [Lo fixed].
io04	[in2 Input] is pattern switching input [hi fixed].
99	Initializes the set data [Resets to the factory setting].

1) “io” mode switching method

- (1) When the power supply to the Controller is OFF, power ON the Controller by pressing both the Vol▲ key and the Freq▼ key together.
- (2) The data display area displays “io01” to start the Controller.
✕If the Controller starts in a normal manner, redo the above (1) and (2).
- (3) Press the Freq▲ key to select the “io” mode to be used.
The display switches “io01” → “io02” → “io03” → “io04” → “99” → “io01” in this order.
When the Freq▼ key is pressed, the display area switches them in the reverse order.
- (4) Press the Set key long for 2 sec to start the controller in a normal manner in the selected “io” mode.
For example, when “io02” is selected, “io02” is displayed when the “io” mode is displayed upon powering ON the controller.

2) Motion in each “io” mode

According to the selected “io” mode, the functional assignment of the input signals (in1 – 3) are differing as follows:

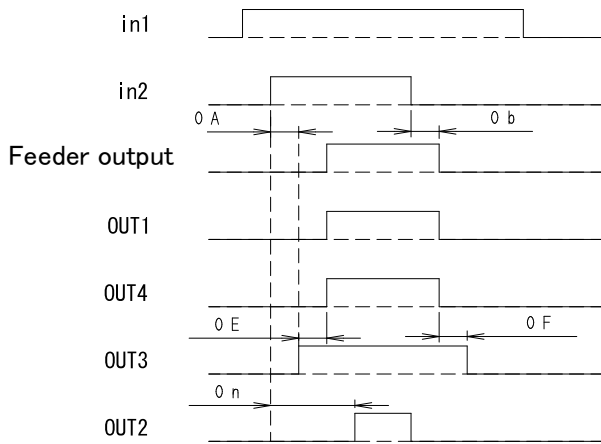
Signal name	Function of input signal	
	io01 / io02	io03 / io04
in1	External signal input	External signal input
in2	Overflow sensor input	Pattern switching input 2
in3	Pattern switching input 1	Pattern switching input 1

The motion of each “io” mode corresponds to the motions in the following time charts (a) and (b).

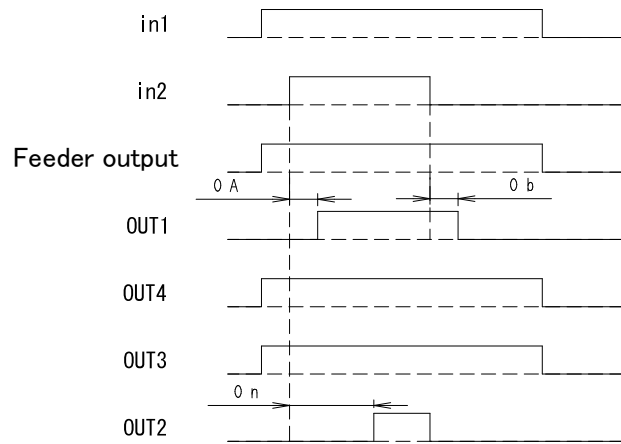
(a) When the in2 input is used for the overflow sensor input. <io01, io02>

The operation pattern can be switched between the following 2 patterns.

① When the io mode is io01



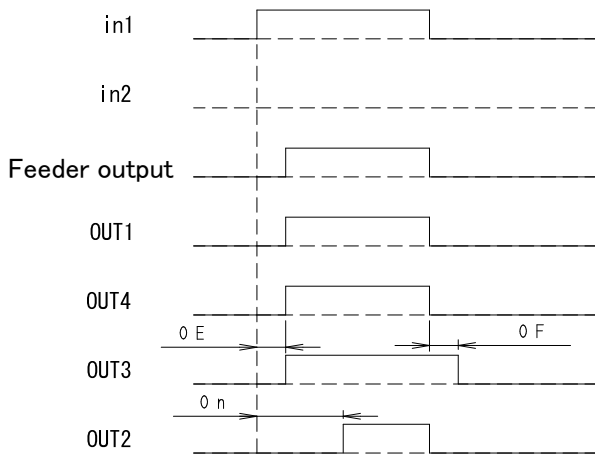
② When the io mode is io02



When the “io” mode is io02, the parameter Nos. 0E and 0F become invalid.

(b) When the in2 input is used for the operation pattern switching input 2. <io03, io04>

The operation pattern can be switched among 4 patterns.



3) Initialization of the set data 【Returning to the factory setting】

- (1) When the power supply to the Controller is OFF, power ON the Controller by pressing both the Vol▲ key and the Freq▼ key together.
- (2) The data display area displays “io01,” and the Controller starts.
※If the Controller starts in a normal manner, redo the above (1) and (2).
- (3) When the Freq▲ key is pressed 4 times, the data display area blinks the “99” display.
- (4) When the Func key and the Set key are pressed long together for 3 sec, all settings are reset.
- (5) When all settings are reset, the data display area lights up the “99” display.
- (6) 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.

11. Remote Unit (RCU-3A)

When the remote unit is connected, the output voltage of the Piezo controller can be operated by remote control.

※The frequency to be used for remote control is the set frequency of the main unit of the controller.

For details of usage of the remote unit, refer to the instruction manual of Remote Unit (RCU-3A).

1) Function

Variable voltage input: 3 contacts (Select variable resistance or analog input of 0 – 5VDC for each contact.)

Switching input of variable voltage input: 3 contacts (No-voltage contact input)

2) Connection

Connect the remote unit to the terminal block (S) of the main unit of the controller Px12-F.

3) Usage

(1) Set the remote unit to valid (Parameter No. 0L:on).

(2) Set [in1] to hi (Parameter No. 06:hi).

(3) Adjust the amplitude by referring to “8. Operation and Amplitude Adjustment Method.”

※The vibration adjusted here is the maximum value that can be operated by the remote unit.

(4) Start operation in the “A” mode.

Operate the start/stop according to the control signal from the remote unit side.

When the start/stop operation is made by using the ON/OFF key of the main unit of the controller Px12-F, the input on the remote unit side becomes invalid.

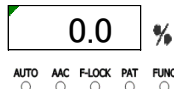
When the setting of the remote unit is valid in the “A” mode, the data display area displays the decimal point of voltage% as shown on the right figure.

30. =

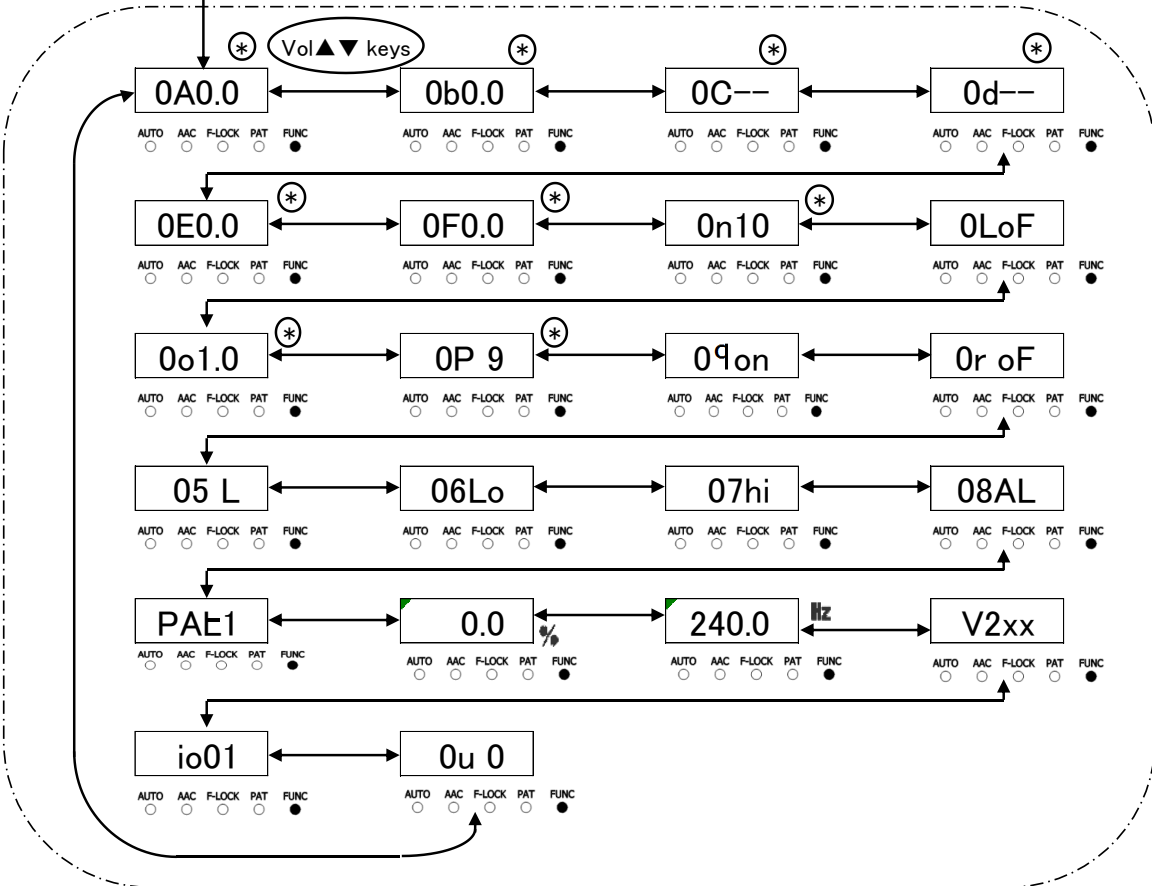
12. Parameter Setting Method

1) Parameter data setting method

Normal mode screen



Parameter mode screen



※When the Vol▲▼ keys are pressed in the parameter mode, the display of the parameter items shown within the following frame can be switched:

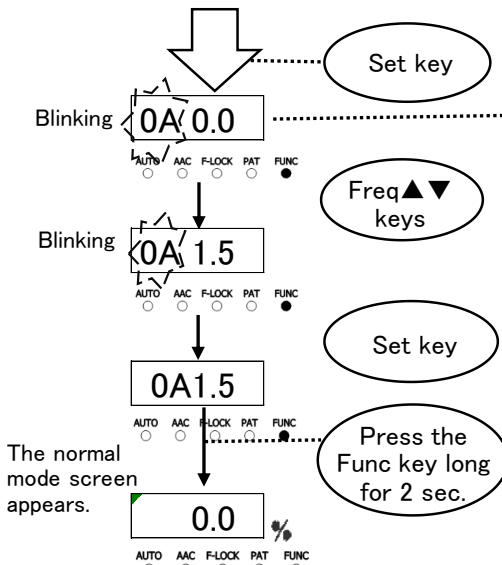
Vol▲ key: Switching 0A → 0b → 0C... in this order

Vol▼ key: Switching 0A → 0u → io01... in this order

※In the A mode, only the parameters marked with “*” can be changed.

In the n mode, all parameters can be changed.

For details, refer to the table of “Parameter Settings.”



※When the Set key is pressed at the parameter to be set, the parameter item blinks, and the parameter value can be changed. Here, Parameter No. 0A is exemplified.

※ When the Set key is pressed after value setting, the set value is saved.

※ If the Vol▲▼ keys are pressed without pressing the Set key in the change process, the changes will not be saved but cancelled.

If there is no key operation for over 5 min, the normal mode screen (voltage display) will be forced to reappear.

2) Parameter list

Each time the Vol▲ key is pressed, the parameter display switches in the descending order of the following table. Each time the Vol▼ key is pressed, the parameter display switches in the ascending order.

No.	Function	Description	Setting range	Default value				Change during operation	Display according to the operation mode	
				operation pattern					n	A
				1	2	3	4			
0A	ON delay timer	in2 Input ON delay timer	0.0–9.9	0.0				○	○	○
0B	OFF delay timer	in2 Input OFF delay timer	0.0–9.9	0.0				○	○	○
0C	Soft start	Output soft start timer	0.2–9.9 --: Invalid	--				○	○	○
0D	Soft stop	Output soft stop timer	0.2–9.9 --: Invalid	--				○	○	○
0E	Start delay timer	Output start delay timer	0.0–9.9	0.0				○	○	○
0F	Stop delay timer	OUT4 Output stop delay timer	0.0–9.9	0.0				○	○	○
0G	Parts shortage timer	in2 Input parts shortage detection	0–99	10				○	○	○
0L	Remote Unit setting	oF: The remote unit is invalid. on: The remote unit is valid.	oF/on	oF				○	○	—
0O	Frequency tracking cycle	Setting of frequency changing cycle	0.1–9.5	1.0				○	○	○
0P	PI control gain	Setting of the speed of output response to vibration change when the constant-amplitude control is in process 1 (slow) ↔ 9 (fast)	1–9	9				○	○	○
0Q	Vibration sensor setting	Use of vibration sensor in the constant amplitude control Valid/Invalid	oF/on	on				○	○	—
0R	Search setting	Use of vibration tuning sensor in automatic tuning of frequency Valid/Invalid	oF/on	oF				○	○	—
0S	Adjusting frequency range	Setting of the search range when the automatic frequency tuning is in process	L: 50–180Hz C: 160–280Hz H: 260–400Hz AL: 50–400Hz	L				○	○	—
06	in1 setting	in1 Input logic	hi: Operation with the contact "Close" Lo: Operation with the contact "Open"	Lo				○	○	—
07	in2 setting	in2 Input logic		hi				○	○	—
08	OUT2 setting	Setting of OUT2 Output function	AL/Er	AL				○	○	—
	Display pattern No.	Backup display pattern No.		PAT1	PAT2	PAT3	PAT4		○	—
	% 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		○	—
	Version information	Program version		V2xx					○	—
	io mode No. display	io01: With overflow stop io02: Without overflow stop io03: 4 patterns [in2:Lo fixed] io04: 4 patterns [in2:hi fixed]	io01/io02 io03/io04	io01					○	—
0U	Amplitude control setting	0: Constant voltage 1: Constant-amplitude and automatic frequency tracking 2: Constant-amplitude	0–2	0				○	○	—

Change during operation: ○ ... Enabled, ■ ... Disabled

Display according to mode: ○ ... Enabled, — ... Disabled

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 forcibly.

Reset the error by either of the following methods (1) and (2).

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 ▼ key and the Freq ▼ key together long for over 3 sec, and the error will be reset.

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. (P312-F only)
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

2) Alert display

If the Set key is pressed when the normal mode is in display, an alert will be displayed.

The output will not stop even during the operation.

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

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 feeder.
E-87	Sensor error 2	The connection between the sensor and the feeder cannot be recognized.

14. Troubleshooting

Trouble	Probable cause	Corrective action
The feeder 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 feeder.	Connect the output connector to the feeder.
	The RUN lamp is OFF.	Check the external control and the overflow sensor. 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 in the “n” mode.	Release the lock.
When the power supply is turned OFF, the voltage and frequency settings disappear.	The data has not yet been saved.	Save the data.
The overcurrent error (E-01) is displayed.	The feeder is probably abnormal.	Contact the dealer.
	Ground fault was caused due to damage to the controller output cable cover or the feeder wire cover.	Replace the damaged cable or wire.
	The frequency is deviant.	Adjust the frequency to the resonance frequency.
	The search range for the automatic tuning of frequency is not appropriate.	Set the parameter No. 05 according to the feeder in use.
When the controller is operated, the E-09 error occurs.	The controller was operated in connection to a large-sized feeder while the vibration was adjusted to a small-sized feeder.	Redo the vibration adjustment.
One of the memory errors (E-10 – 12) occurs when the controller starts.	There was a memory error when the power supply was turned ON.	Reset the power supply. If the same error recurs, contact our sales agent for consultation.

15. Options

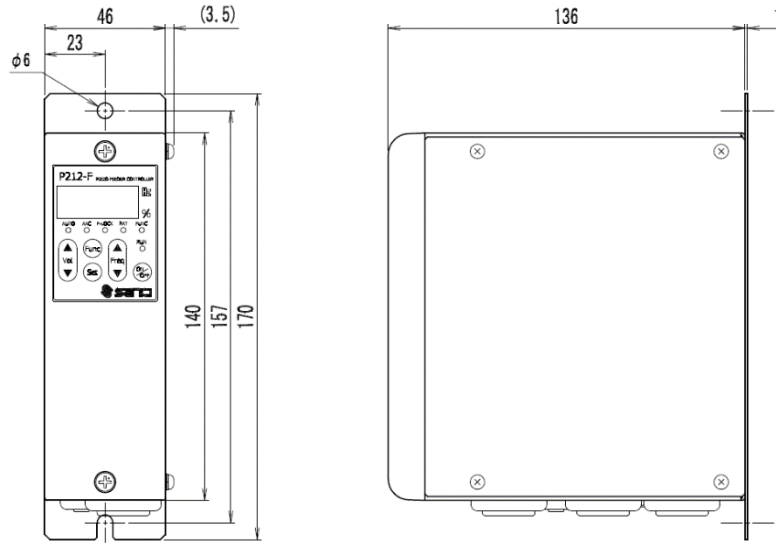
Name	Applied wire	Length (mm)	Terminal		Remarks
Power cable	VCTF 0.75x3	1200	Nichifu pin terminal male	PC-2005M	Mounting as standard
Output cable	VCTFK 0.75x2	1200	Molex terminal	1189ATL	
			Molex housing 3P	1396R1	
Overflow sensor input cable (P3 cord)	VCTF 0.3x3	300	Molex terminal	1381ATL	
			Molex housing 3P	1396R1	
Vibration sensor input cable (P4 cord)	MOGAMI 2330 (Low Noize Wire)	1200	Molex terminal	1189ATL	Accessory
			Molex housing 2P	1545R1	
Vibration sensor (KS-3)	MOGAMI 2330 (Low Noize Wire)	1000	Molex terminal	1190TL	Sold separately
			Molex housing 2P	1545P1	
Vibration sensor input extension cable	MOGAMI 2330 (Low Noize Wire)	2000	Molex terminal	1190TL/1189ATL	
			Molex housing 2P	1545P1/1545R1	

16. Specifications

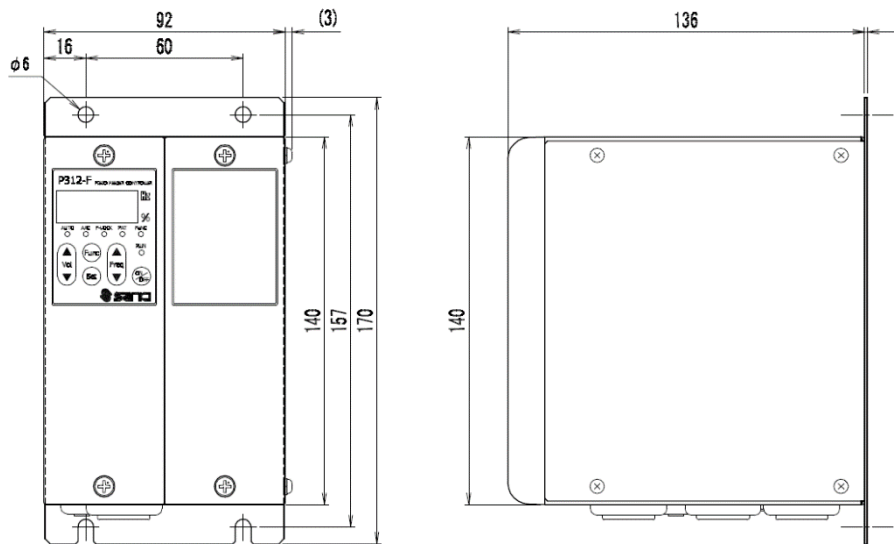
Model		P212-F	P312-F
Input	Voltage	100/230VAC±10%	
	Frequency	50/60Hz	
	Number of phases	Single phase	
Output	Control method	Sine wave PWM method	
	Maximum current	50mA	170mA
	Voltage	0 – 240VAC	
	Frequency	50 – 400Hz	
Operation mode	Constant-voltage mode	Constant-voltage control with the set frequency	
	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 feeder	
Vibration sensor (Sold separately)		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 (Indicated REF- or later model)	90A,120A,150A 110i,150i	190A,230A,300A, 390B,460B 190i
	Inline feeder (Indicated REF- or later model)	L5A,L15A L25A,L60A,L125A L30AG,L75AG,L150AG, L200AG,L250AG	

17. Outside Dimensional Drawing

【 P 2 1 2 - F 】

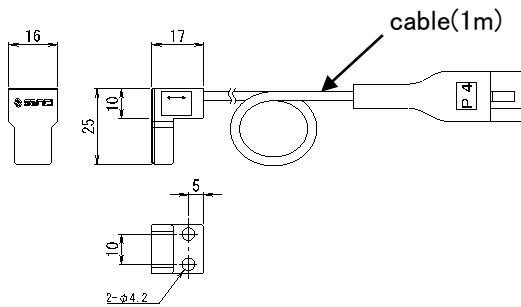


【 P 3 1 2 - F 】



※The input and output cables are omitted.

【Vibration sensor K S - 3】 (Sold separately)



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.

Issued in February 2015
Revision: February 2017, Ver. 2

[Revision to Ver. 1 – Additions and changes]

1. This instruction manual was reviewed overall.
2. The LOAD and SAVE operations for parameters were abolished, and automatic saving was adopted.
3. Parameter setting for each operation pattern was abolished, and common setting was adopted.
4. The display and change operations of setting parameters were made enabled only in the “n” mode.
5. The SAVE operation of voltage, frequency and vibration quantity was made enabled only during operation.
6. Operation pattern switching by panel operation in the “A” mode was abolished.
7. Fine-adjustment function of vibration in the “A” mode was added.
8. The “io” mode setting function was added.
9. Compatibility with the Remote Unit (RCU-3A) was established.

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