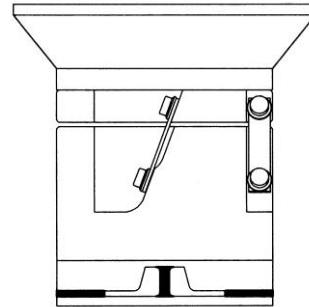


NTN

INSTRUCTION MANUAL

Before use
 Read this Instruction Manual thoroughly, and operate the machine correctly.

NTN Bowl Feeder Type K10/K14/K16/K20



Introduction

Thank you for your purchase of the **NTN bowl feeder**.
 For correct operation of the **NTN bowl feeder**, read the Instruction Manual carefully before use, and ensure execution of safe work through correct operation.
 Be sure to deliver this Instruction Manual to the end user. Users are requested to keep the Instruction Manual in a place to facilitate ready reference at any time after reading.

1. Before Use












Contents

- When the machine is delivered, check for damage during transport and missing parts. If any trouble is found, inform the sales office nearby.
- When packaging of the machine and holding fixture for transport are attached to the body, be sure to remove them before use.
- Be sure to use **NTN controller and bowl** for this machine. Otherwise, specified performance of the machine may not be obtained.

	Page
Introduction	1
1. Before use.....	1
2. Precaution for safety	2 - 3
3. Operating principles	3
4. Names of main component parts	4
5. Dimensional drawing.....	5
6. Transportation and installation.....	6
7. Wiring and operating methods	7 - 8
8. Inspection and adjustment	8 - 11
9. Troubleshooting.....	12
10. Specifications	13-15

2. Precaution for Safety

This machine is designed and manufactured for parts feeding equipment based on the concept of trouble-free operation and labor saving. However, the user is also responsible for ensuring safety. Read this manual carefully before starting use, and be sure to follow the description below on safety. Also be sure to follow the warning and caution label attached to the body.

	<p>WARNING</p>	<p>indicates a potentially hazardous situation which, if not avoided, will result in death or serious injury.</p>
	<p>CAUTION</p>	<p>indicates a potentially hazardous situation which, if not avoided, will result in minor or moderate injury or property damage only.</p>
<p> WARNING</p>		
	<p>The most dangerous part of the machine is electric equipment. Be sure to connect a grounding wire. Failure to do so may result in electric shock.</p>	
	<p>Never use the machine in the atmosphere of explosive gas or flammable gas, or in a wet place. Explosion or fire hazard may be caused.</p>	
<p> CAUTION</p>		
	<p>Do not use the machine in a place exposed to splash of water, outdoors, or in a place of extremely low temperature or high temperature and high humidity. (See the next page for operating environmental conditions.)</p>	
	<ul style="list-style-type: none"> • This machine is a heavy material. (See the specification in Section 10 for the mass.) In transporting the machine, wear safety shoes, watch out for dropping, and take due care. • Fix the machine securely after installation. 	
	<ul style="list-style-type: none"> • Do not conduct the installation and assembly work with bare hands. • As for a bowl equipped with alignment mechanism, pay attention to sharp edges and do not touch with bare hands. <u>Be sure to wear gloves.</u> 	
<p>Do not use the machine on a base lacking in sufficient strength or in an unstable place. The specified performance of the machine may not be ensured.</p>		
	<p>Do not install the body in inclination. The specified performance of the machine may not be ensured.</p>	
<p>Please do not scratch, pull or forcibly bend the wiring. Moreover, when a heavy thing is put on it, or it is pinched, the wiring will damage. It causes a fire or an electric shock.</p>		
	<p>When conducting welding to the bowl, be sure to connect the grounding clip of the welding machine to the bowl securely. If grounding for welding is incomplete, the grounding wire connecting the body to the controller will burn, possibly resulting in electric shock or electric leakage.</p>	

□ For correct operation of the machine

- [1] The **NTN bowl feeder** is a vibrating machine with a bowl equipped with the mechanism to align the orientation of specified parts to thereby align and feed parts in bulk state to a specified point of place. Do not use the machine for other purposes such as material tests and as equipment such as sieve.
- [2] Operate the **NTN bowl feeder** in accordance with instructions given in this Instruction Manual. For technical specifications, see Section 10 “Specifications”.
- [3] For operation of the machine, be sure to use an **NTN controller and bowl**. Further, be careful to select a controller, bowl and power supply conforming to the machine.
- [4] The resultant noise level varies with specifications of the machine and materials of parts to be fed. If the noise level should be in excess of the tolerance limit, take countermeasures against the noise such as fitting of a noise shielding cover.

(Note 1) Do not use the machine, when it is not in perfect condition (such as unusual noise, abnormal vibration and omission of parts).

(Note 2) Where the bowl is equipped with the mechanism to align specified parts, any parts other than the specified parts cannot be charged.

(Note 3) Operating environmental conditions

Operating ambient temperature	0 to 40°C
Operating ambient humidity	30 to 90% (No dew condensation is allowed.)
Operating altitude	1000 m max.
Storage temp. during transportation	-10 to 50°C
Atmosphere at operating place	No splashing of water and chemicals is allowed. No flammable gas and corrosive gas are permitted. To be operated indoors.

□ User observance items

- [1] Conduct all operations of the machine including run, maintenance and repair in accordance with instructions given in this Instruction Manual.
- [2] Be fully careful to avoid such operations as to jeopardize the safety of the **NTN bowl feeder**. If a sign of change liable to jeopardize the safety of the machine should be found, inform NTN to that effect.

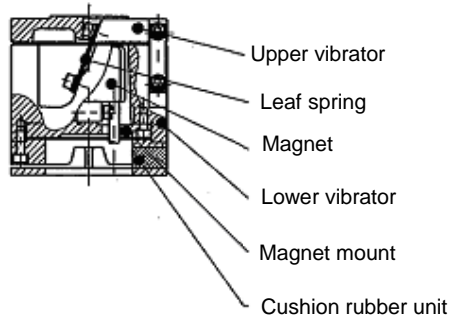
(Note) Ensure installation, operations, maintenance and repair of the **NTN bowl feeder** by professional engineers. In addition, ensure that the machine is not operated by any person other than those concerned.

3. Operating Principles

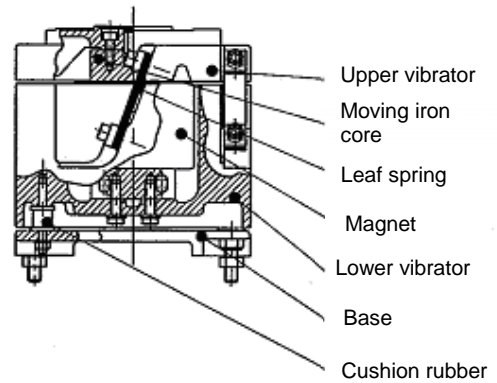
NTN bowl feeder is designed to magnetically vibrate a bowl and a lower vibrator coupled to each other with a leaf spring set at a certain angle of inclination. As a result of this rotary vibration, works are aslant in the upward direction in the bowl to go forward little by little. The relationship between the bowl and the leaf spring is so set that the vibration may be nearly resonant to the suction frequency of the vibration magnet. Accordingly, a large vibration can be put forth with small exciting force.

4. Names of Main Component Parts

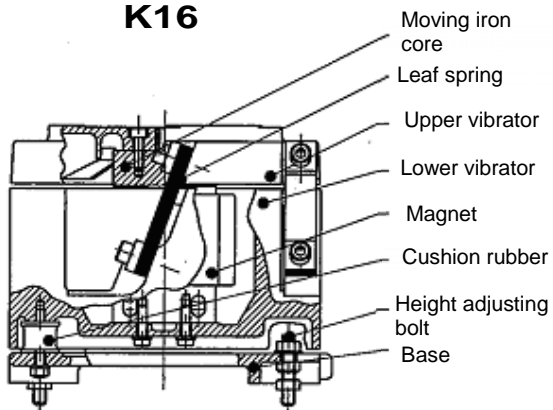
K10



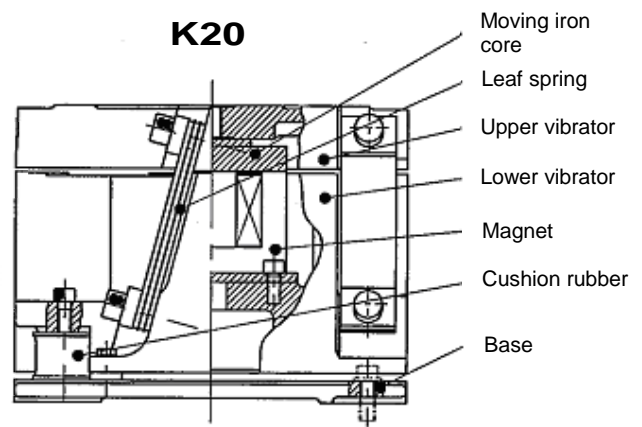
K14



K16



K20



(Note 1) The shapes of the bowl and the controller may be different from those shown above.

(Note 2) Use of the height adjusting bolt will enable fine adjustment of the work outlet height.

(Optional for K10 and K20)

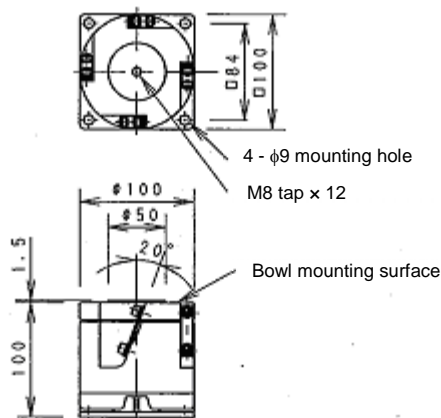
5. Dimensional Drawing



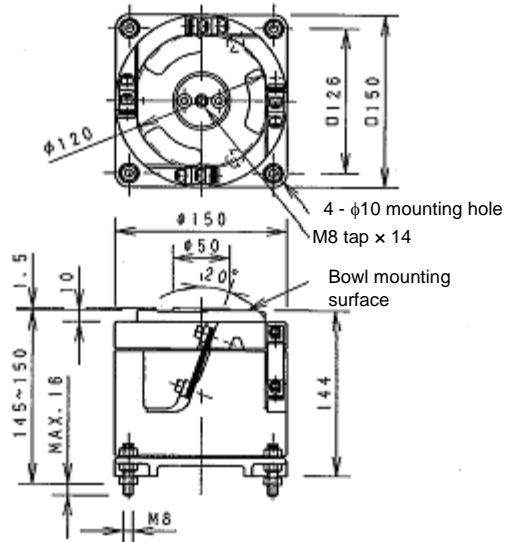
CAUTION

When mounting a bowl, be careful of the center bolt length. Ensure that the thread length protruding from the bowl bottom face does not exceed the tap length shown. Note carefully that insertion of a bolt with longer thread will damage the drive unit, resulting in unavailability of full exhibition of the function of the machine.

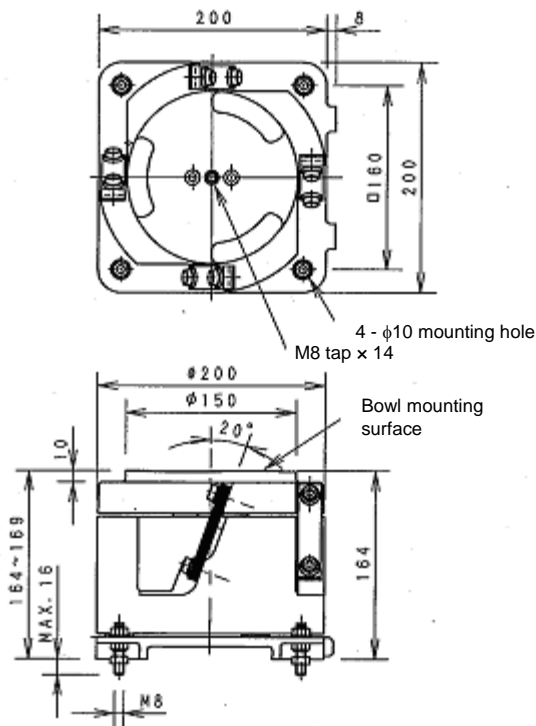
K-K10 ^{R1}/_{L2}



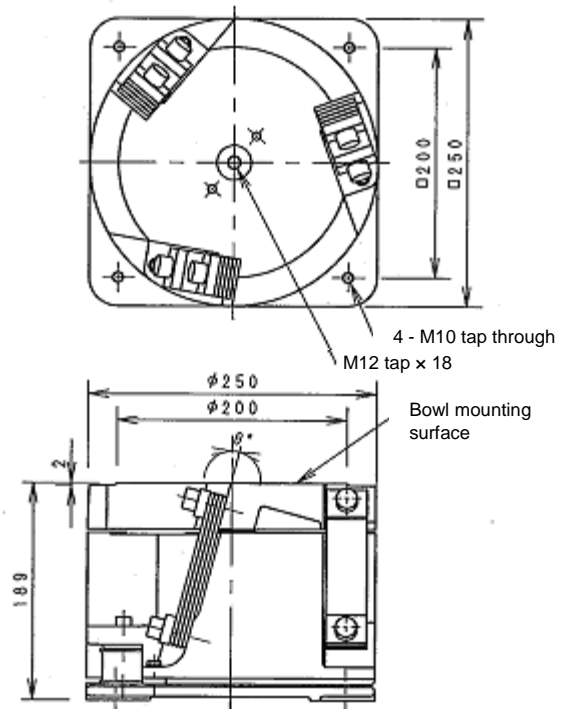
K-K14 ^{R1}/_{L2}



K-K16 ^{R3}/_{L2}



K-K20 ^{R1}/_{L2} **K-K20** ^{R3}/_{L4}



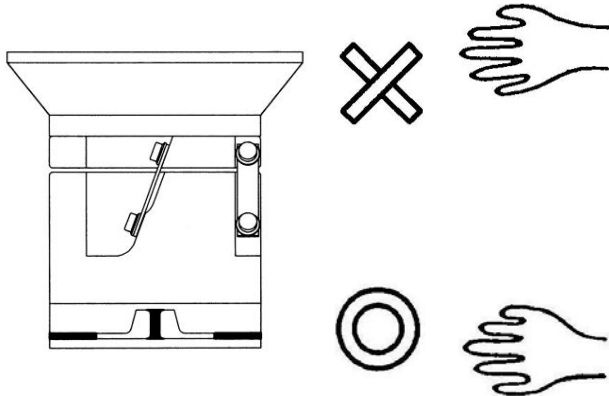
6. Transportation and Installation



CAUTION

The machine is heavy. Relocate the machine carefully with careful attention not to cause drop.

(1) Transportation



- Relation of the machine with the bowl held may cause deformation of the alignment mechanism. Be sure to hold the cushion rubber unit or the base.

□ Precautions for transportation

This machine is a heavy material. Watch out for dropping in transporting and be cautious enough. Again, you must not carry it alone. They must be carried carefully by more than one personnel or by use of lifting apparatus or hoisting attachment with sufficient lifting capacity.

Refer to item 10 Specification for the mass of the body (adding the mass of bowl if attached).

(2) Installation

NTN bowl feeder is internally provided with the cushioning function. Accordingly, it is not required to provide the parts feeder mount with the countermeasures against vibration. Bolt the mount securely, making use of four mounting holes of the cushion rubber unit (K10) or base (K14, K16 and K20).

□ Precautions for installation

- [1] Assemble and set the machine with sufficient care paid to defects such as deformation of the bowl and the alignment mechanism.
- [2] Wear safety gloves to prevent bare hands from coming into contact with sharp edges of the bowl and the alignment mechanism.
- [3] Do not operate the machine on a base with insufficient strength or in an unstable place.
- [4] Be careful not to fix the machine with its vibrating part (other than the base) in contact with other parts.
- [5] When the machine is inclined in installation, specified capability cannot be obtained. Be sure to level the machine.
- [6] When execution of welding work or grinding work is intended in vicinity of the bowl feeder, fit a protective cover to the entire bowl feeder. Otherwise, infiltration of iron powder or the like into the machine to spoil its performance.

7. Wiring and operating methods

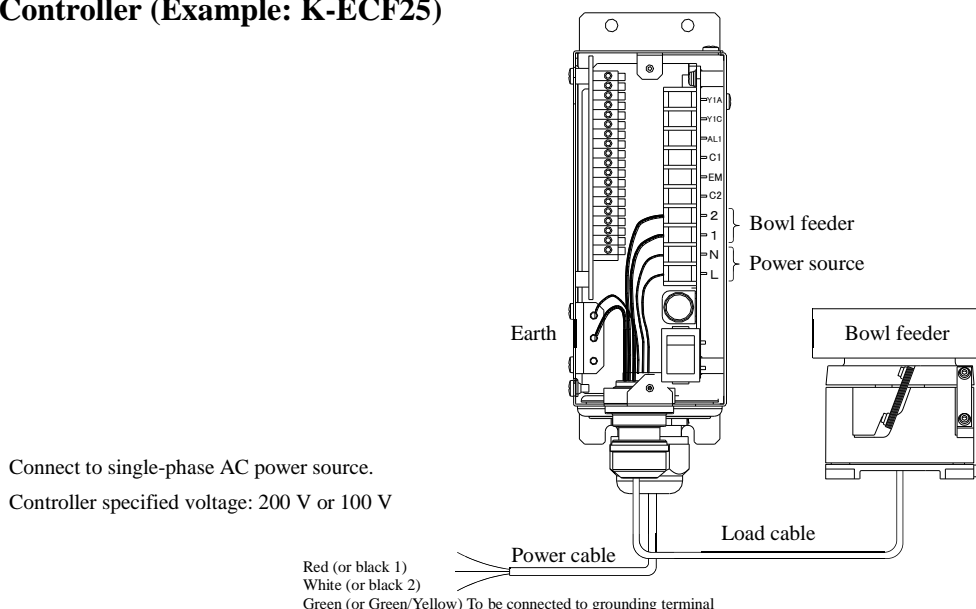
WARNING

Ensure that the supply voltage is as shown on the machine nameplate (seal bearing the type, power supply and manufacturer's serial No.) of the vibrator body. Be sure to connect the grounding wire of the power source.

CAUTION

Relating to controllers provided with selector switches (such as selection of full wave/half wave, 50/60 Hz and 100/200 V) and variable frequency controllers provided with the F-V curve setting function, adjust the settings to the specifications and power requirements of the body. Wrong setting may cause accidents such as burning of the magnet. For setting of the selector switches and the F-V curve, refer to the Instruction Manual for the bowl feeder controller.

Controller (Example: K-ECF25)



*1 In the case of 3-phase power supply, use two phases out of three. Do not use the remaining one phase.

- (1) Remove fixtures used for transportation of the chute and the bowl feeder, if they are still provided.
- (2) Connect the power supply. (For detailed connection method, refer to the Instruction Manual for the bowl feeder controller.)
- (3) Turn the controller speed control knob counterclockwise up to the position of the scale "0". (Check that the bowl feeder is in free state without coming into contact with others located in vicinity.)
- (4) Put parts in the bowl and turn ON the POWER switch of the controller. (Confirm lighting of LED on the operation panel.)
- (5) Turn the speed adjusting knob of the controller slowly clockwise to set the graduation at a workpiece speed that matches with supply capacity. Operate this machine under the maximum acceptable amplitude of leaf spring in the item 8 in order to prevent breakage of leaf spring.

- (Note 1)** When the bowl feeder is used in assembly with another device or the like, do not turn On-Off the “On-Off” switch on the primary side of the controller but make use of the external control signal input terminal.
- (Note 2)** Ensure that the power connection work is executed by electrical engineers. When modification or change of wiring is intended, be sure to refer to the Instruction Manual for the bowl feeder controller.
- (Note 3)** Where a bowl is provided with an alignment mechanism and an instruction mark is located around the speed control knob of the controller, operate the machine with the speed control knob position adjusted to the marking.
- (Note 4)** When extension of the load cable is intended by your company, ensure the extension length of 10 m max. in use of a cable of 2.5 mm² min. in size. In addition, conduct the protective continuity test to check that the machine is grounded appropriately.
- (Note 5)** For details of required operation of the controller to be used, refer to the Instruction Manual for the bowl feeder controller.

8. Inspection and Adjustment

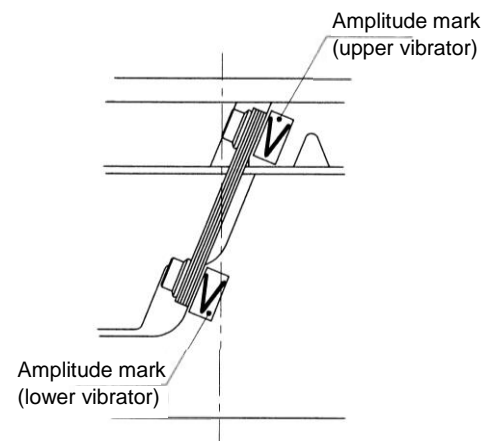
(1) Inspection and adjustment of leaf spring

[1] Acceptable maximum amplitude of leaf spring

To prevent break of the leaf springs, operate the machine at amplitude lower than shown in the following table.

If the machine should be operated at higher amplitude, the leaf springs may break at an early date. When measuring the amplitude, be sure to attach the supplied amplitude marks as shown below and total the readings of upper and lower amplitudes.

Type·size	Leaf spring part No.	Amplitude (upper area + lower area)
K10	K-PLS2-35 × 5 (K-PLS2-35 × 4)	0.6 mm (0.8 mm)
K14	K-PLS2-50 × 9 (K-PLS2-50 × 7)	1.1 mm (1.4 mm)
K16	K-PLS2-67 × 12-1	1.2 mm
K20	K-PLS2-116 × 35-1	1.3 mm
	K-PLS2-116 × 20-2	2.3 mm

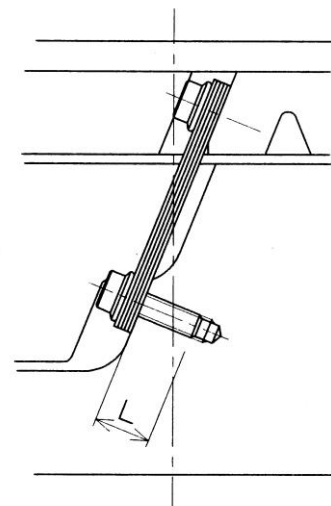


(Note) When a recommended speed is designated by **NTN**, adjust the volume position to the recommended scale.

[2] Caution in attaching and detaching leaf spring

When attaching and detaching the leaf spring, be sure to complete one unit before moving to the next unit. Do not loosen all the units at the same time.

- a) Change the bolt length according to the increase or decrease in the number of springs on assumption that required bolt bite length (Dimension L includes the dimension on the upper vibrator side) is at least 2 times as large as screw diameter (at least 8 mm for K10). Tighten bolts securely while referring to the tightening torques shown below as standard values.

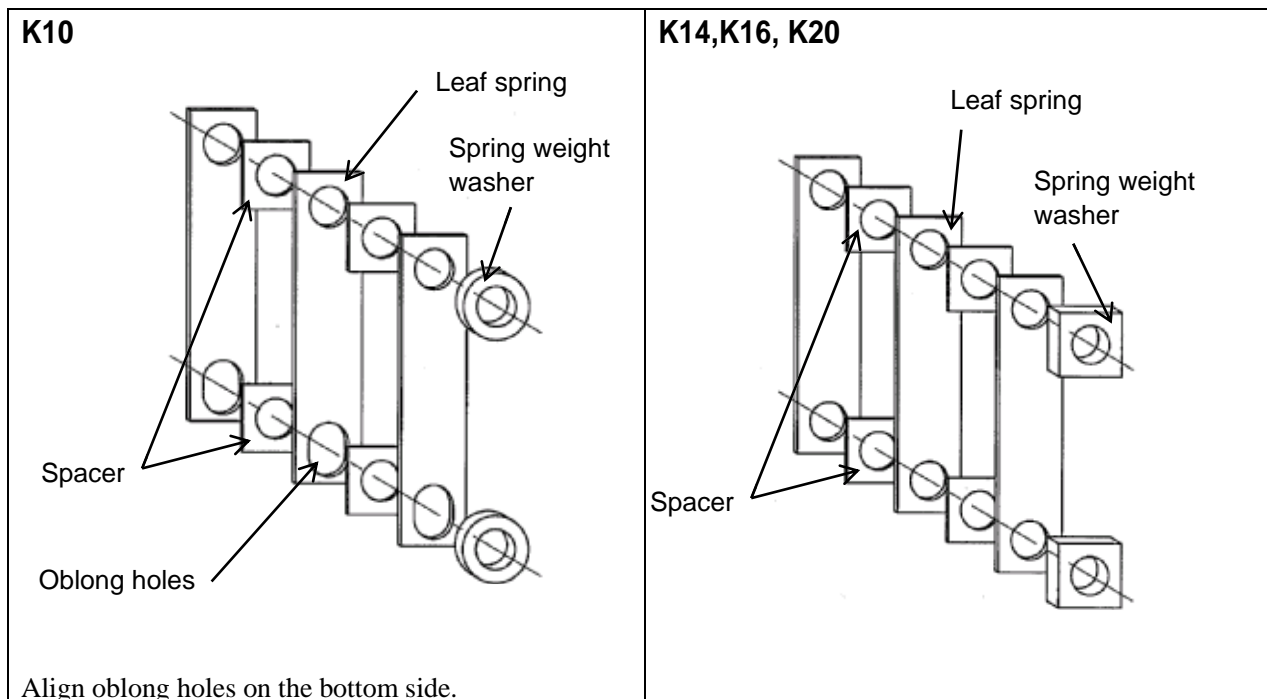


Type size	Bolt used	Tightening torque
K10	Washer based hexagon socket head cap screw M5 (strength division of 10.9 or higher)	About 8.8 N·m { 90 kgf·m }
K14	Washer based hexagon socket head cap screw M6 (strength division of 10.9 or higher)	About 14.7 N·m { 150 kgf·m }
K16	Washer based hexagon socket head cap screw M8 (strength division of 10.9 or higher)	About 34.3 N·m { 350 kgf·m }
K20	Hexagon socket head cap screw M12 (strength division of 10.9 or higher)	About 117.6 N·m { 1200 kgf·m }

(b) Assemble the leaf springs and spacers after applying grease or rust preventive oil between them.

(Note 1) Be careful not to include dirt, chips and others between leaf springs.

(Note 2) As to K14, K16 and K20, press the leaf springs against the body side and align their end faces before assembly.



[3] Retightening

Check the leaf spring tap bolts (or nuts) after actual run for about 40 hours, and retighten the bolts.

When the bolts have been tightened to normal torque, there hardly is allowance for additional tightening, but consider this requirement as retightening to ensure comfortable fitting of leaf springs.

[4] Correction of fatigue

When the SPEED ADJ. volume come to be used at the max. position at all times, add one or two pieces of leaf springs to any one place of the leaf spring unit.

Even if the leaf spring mounting bolts are fastened normally, the spring constant of spring itself may reduce owing to repetitive stress resulting from vibration after the machine is run for 40 to 100 hours. As a result, the amplitude may decrease negligibly.

[5] Replacement of leaf spring

Replacement of all leaf springs is recommended after run of the machine for 1 year on the basis of 8-hour run a day as a guideline.

If the amplitude cannot be recovered even after correction of set in fatigue in the paragraph ④ above, it is considered that the leaf springs have reached the end of life. 100% replacement of leaf springs is recommended.

(Note) When new leaf springs are required, place an order with us while referring to the part No. of the leaf spring shown in Section 10 “Specifications”.

(2) Check and adjustment of clearance in magnet

The clearance between the magnet and the moving iron core (K10 is upper vibration) is set to a value shown in the following table when the body is shipped from NTN. But, since minimization of the clearance is advisable to the extent not to allow contact of them with each other at the occasion of maximum amplitude, check the clearance from time to time to keep a proper value.

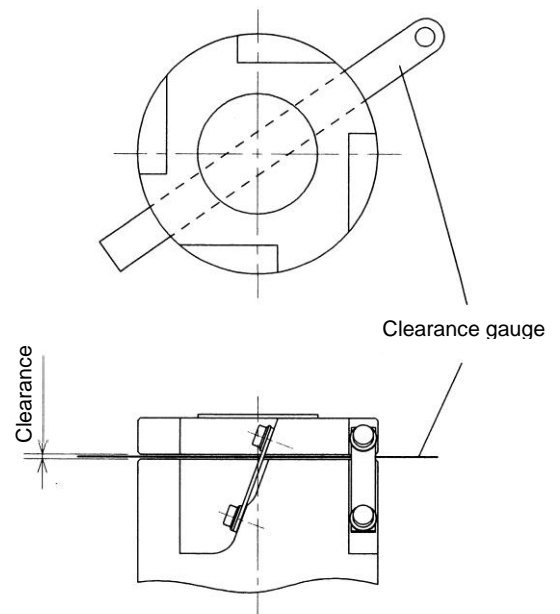
In a much dusty environment, such dust may stick to the magnet and the movable iron core solidly to narrow the clearance, possibly resulting in generation of unusual noise. Conduct check to remove dust and others periodically.

<Adjusting method>

Insert a clearance gauge of 0.1 t to 0.6 t into the clearance in the magnet as shown, and adjust the clearance at the oblong hole in the leaf spring in the case of K10 and the circle hole in the leaf spring in the case of K14, K16 or K20.

Check after adjustment of the clearance that the clearance between the top vibrator and the bottom vibrator is uniform in the forward/backward and right/left directions.

Type/Drive method	Magnet clearance (mm)	
	In shipment	Maximum
K10 (Full wave)	0.3	
K14 (Full wave)		
K16 (Full wave)		
K20 (Full wave)		
K20 (Half wave)	0.6	



⚠ CAUTION

When the machine is operated with the clearance in the magnet increased by 20% in excess of the maximum value shown above, the magnet may burn. Check the clearance in the magnet from time to time to keep a proper value.

(3) Change of power frequency

The power frequency of the **NTN bowl feeder** is adjusted in conformance to the value applicable to the area where it is used or the preset frequency for the controller. Accordingly, normal vibrations cannot be ensured, if the power frequency or the preset frequency for the controller as the output frequency for driving should change. When change of the power frequency is intended, strictly observe the procedure described below.

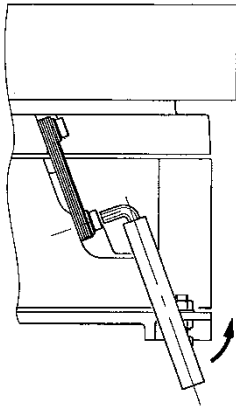
(Note) Where the output frequency for driving is set on a variable frequency controller, change of settings is not required, even if the power frequency (50 Hz ↔ 60 Hz) is changed.

[1] Change of number of leaf springs

50 Hz → 60 Hz: Increase the number of leaf springs by about 40%.

60 Hz → 50 Hz: Decrease the number of leaf springs by about 30%.

<For information: How to check the number of leaf springs for surplus or shortage>



Check according to the following method whether the number of leaf springs currently mounted is excessive or short for the bowl and the alignment mechanism used.

Slightly loosen the leaf spring mounting bolt located at one place while allowing continuous vibrations of the machine, and check the amplitude.

- Amplitude increased. → Number of leaf springs is too large.
- Amplitude decreased. → Number of leaf springs is too small or proper.

Optimum number of leaf springs is that sufficient amplitude is ensured and that the amplitude decreases when the bolt is loosened.

[2] Changeover of frequency in controller

Set the frequency as shown below. For details, refer to the Instruction Manual for individual controllers.

Power source frequency	In the case of 50Hz		In the case of 60Hz	
Setting of DIP switch by K-EGA57.	SW2	ON	SW2	OFF
	SW3	OFF	SW3	ON

9. Troubleshooting

If any trouble should be found, check the following points:

(1) No vibration at all

In this case, conduct checking after dividing the trouble contents into those of the mechanical system and the electric system.

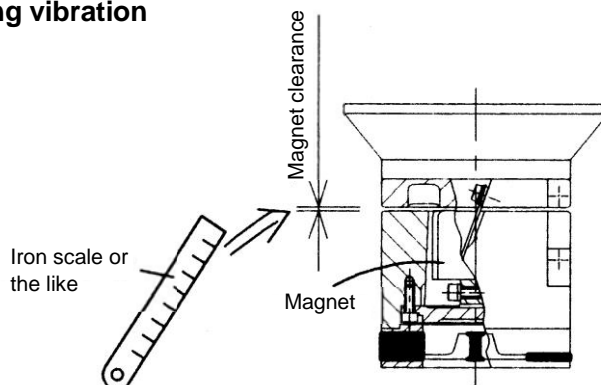
Turn ON the POWER switch, and insert an iron piece into the clearance in the magnet as shown below.

[1] When the iron piece is attracted strongly during vibration

Electric system is normal. Accordingly, the cause of the trouble lies in either setting of the number of leaf springs of the bowl feeder or wrong designation of the power frequency.

[2] When the iron piece is not attracted at all

Trouble of electric system including controller and magnet. However, if the controller is equipped with a sensor, it is possible that the detection head detects a workpiece. It is not a trouble. Align optical axis or recheck proximity distance, etc.



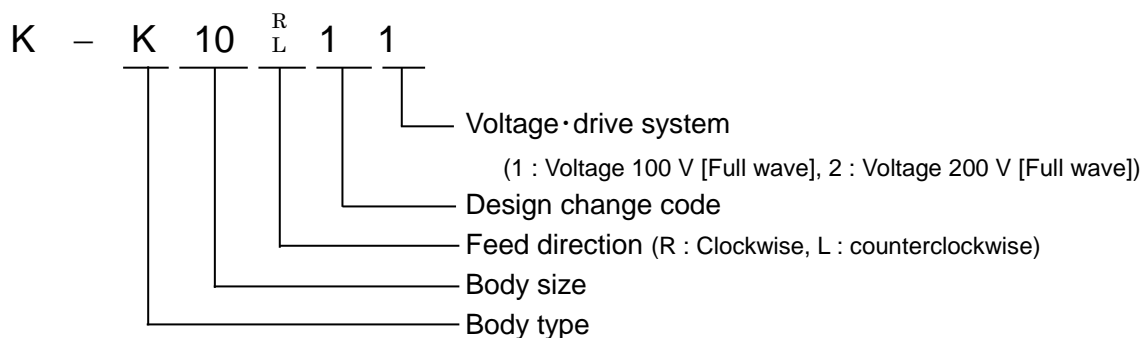
Further, check the following points for electric system for safety:

- a) Power supply is connected properly. (See the Section 7 “Wiring and Operating Methods”.)
- b) No melting of controller fuse and no working of overcurrent protective function
- c) Shorting of the controller external control signal input terminals. Closing of the terminals according to external control signal (refer to the Controller Instruction Manual.)

- | | |
|---|---|
| (2) Vibration is available but amplitude is insufficient | <ol style="list-style-type: none">[1] Imperfect power source (such as 100 V connection in spite of 200 V specification)[2] Leaf spring mounting bolt is loosened.[3] Tightening bolt of bowl etc. is loosened.[4] Magnet clearance is too large.[5] Omission of removal of fixtures used for transportation |
| (3) Amplitude is decreasing during use | <ol style="list-style-type: none">[1] Leaf spring is fatigued.[2] Leaf spring mounting bolt is loosened.[3] Leaf spring is damaged, and rust is found.[4] Foreign substance is caught in the magnet clearance.[5] Bowl tightening bolt is loosened. |
| (4) Unusual metallic noise | <ol style="list-style-type: none">[1] Contact of magnet with moving iron core due to narrow magnet clearance or inclusion of foreign matter in magnet clearance[2] Over-amplitude[3] Non-removal of transportation fixtures |

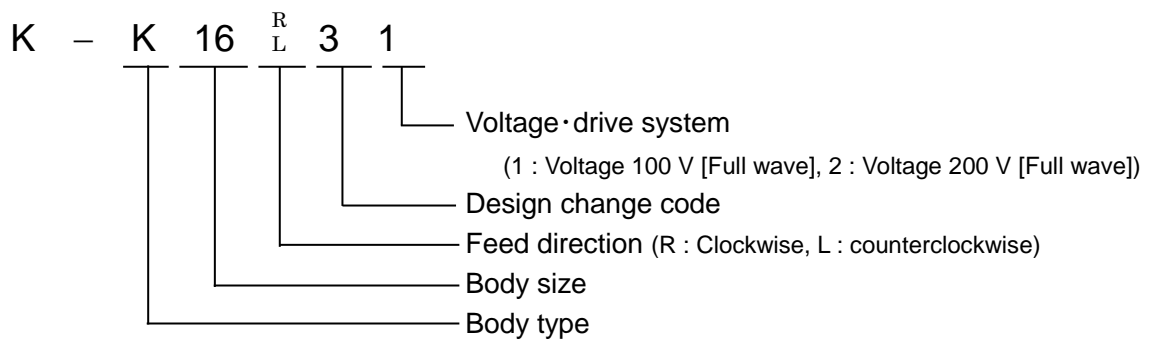
When you inform NTN of trouble condition with unknown cause, let them know the detail as far as possible with reference to the above so that they can take a measure as soon as possible.

10. Specifications



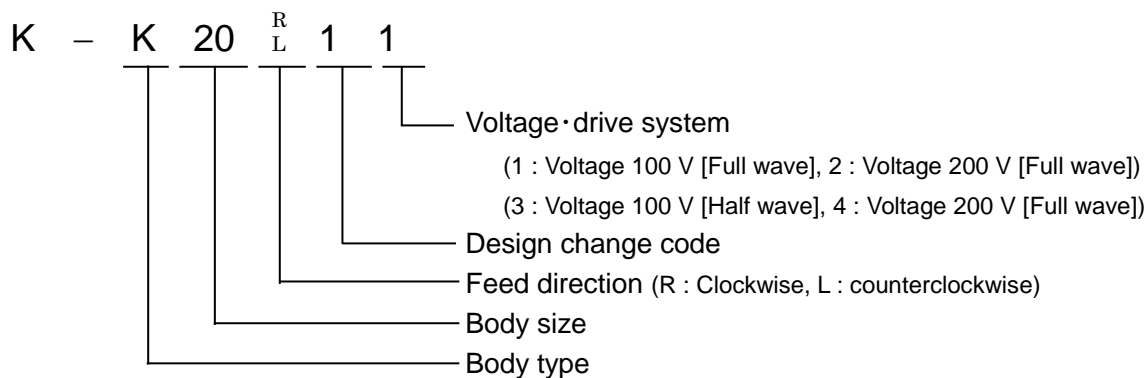
Product No.	K-K10 ^R / _L 1	K-K10 ^R / _L 2	K-K14 ^R / _L 1	K-K14 ^R / _L 2
Supply voltage (V)	100	200	100	200
Consumption current (A)	0.3	0.15	0.7	0.35
Dissipation power (VA)	30	30	70	70
Drive method	Full wave			
Frequency (times/min)	6000 (50 Hz), 7200 (60 Hz)			
Spring angle (θ°)	20°			
Max. loading mass (kg) (work + bowl mass)	1.5		2.5	
Magnet part No. (No. of magnet used)	K-PMG-111-1 (1 piece)	K-PMG-121-1 (1 piece)	K-PMG-211-1 (1 piece)	K-PMG-221-1 (1 piece)
Cable size × length (from center)	1.0 mm ² × 1.1 m			
Leaf spring fitting (places)	4			
Standard No. of leaf springs set	4 pieces × 4 places = 16 pieces		6 pieces × 4 places = 24 pieces	
Leaf spring part No. (material)	K-PLS2-35 × 5 (Steel)		K-PLS2-50 × 9 (Steel)	
Leaf spring dim. (mm) Length (hole pitch) × Width × Thickness	46 (35) × 10 × 0.5		64 (50) × 14 × 0.9	
Leaf spring fixing bolt strength division	12.9			
Leaf spring tightening torque	8.8 N·m (90 kgf·cm)		14.7 N·m (150 kgf·cm)	
Outside coating color	Black/silver			
Mass (kg)	3.6		10.0	

Note) For controllers that can apply to this machine, refer to the Catalog and the Controller Instruction Manual.



Product No.	K-K16 ^R / _L 31	K-K16 ^R / _L 32
Supply voltage (V)	100	200
Consumption current (A)	1.8	0.3
Dissipation power (VA)	180	60
Drive method	Full wave	
Frequency (times/min)	6000 (50 Hz), 7200 (60 Hz)	
Spring angle (θ°)	20°	
Max. loading mass (kg) (work + bowl mass)	7.5	
Magnet part No. (No. of magnet used)	K-PMG-311-3 (1 piece)	K-PMG-321-4 (1 piece)
Cable size × length (from center)	1.0 mm ² × 1.1 m	
Leaf spring fitting (places)	4	
Standard No. of leaf springs set	7 pieces × 4 places = 28 pieces	
Leaf spring part No. (material)	K-PLS2-67 × 12-1 (Steel)	
Leaf spring dim. (mm) Length (hole pitch) × Width × Thickness	87 (67) × 20 × 1.2	
Leaf spring fixing bolt strength division	12.9	
Leaf spring tightening torque	34.3 N·m (350 kgf·cm)	
Outside coating color	Black/silver	
Mass (kg)	20	

Note) For controllers that can apply to this machine, refer to the Catalog and the Controller Instruction Manual.



Product No.	K-K20 ^R _L 1	K-K20 ^R _L 2	K-K20 ^R _L 3	K-K20 ^R _L 4
Supply voltage (V)	100	200	100	200
Consumption current (A)	2.5	1.5	2.0	1.0
Dissipation power (VA)	250	300	200	200
Drive method	Full wave		Half wave	
Frequency (times/min)	6000 (50 Hz), 7200 (60 Hz)		3000 (50 Hz), 3600 (60 Hz)	
Spring angle (θ°)	15°		25°	
Max. loading mass (kg) (work + bowl mass)	10			
Magnet part No. (No. of magnet used)	K-PMG-411-1 (1 piece)	K-PMG-421-1 (1 piece)	K-PMG-411-2 (1 piece)	K-PMG-421-2 (1 piece)
Cable size × length (from center)	1.5 mm ² × 1.1 m			
Leaf spring fitting (places)	3			
Standard No. of leaf springs set	4 pieces × 3 places = 12 pieces		3 pieces × 3 places = 9 pieces	
Leaf spring part No. (material)	K-PLS2-116 × 35-1 (Steel)		K-PLS2-116 × 20-2 (Steel)	
Leaf spring dim. (mm) Length (hole pitch) × Width × Thickness	136 (116) × 35 × 3.5		136 (116) × 35 × 2.0 (Z spring)	
Leaf spring fixing bolt strength division	12.9			
Leaf spring tightening torque	117.6 N·m (1200 kgf·cm)			
Outside coating color	Black/silver			
Mass (kg)	35			

Note) For controllers that can apply to this machine, refer to the Catalog and the Controller Instruction Manual.

About NTN Parts Feeder Shipping Warranty Card

A shipping warranty card is attached to this product. Be sure to receive the card at the occasion of your purchase of the product.

The warranty card assures free repair of the product in accordance with conditions specified in the card. You are requested to keep the card after reading the descriptions given therein carefully.

- The Instruction Manual is subject to change without prior notice for functional improvement or other purposes.

Revised : Oct. 1, 2013

The NTN logo consists of the letters 'NTN' in a bold, stylized, sans-serif font. The 'N' is the largest and most prominent, with the 'T' and 'N' slightly smaller and positioned to its right. The letters are black and set against a white background.

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