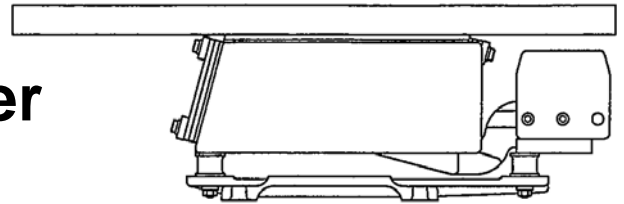


# NTN

## INSTRUCTION MANUAL

### NTN Linear Feeder Type S10/S20/S30 (Globally applicable type)

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



#### Introduction

Thank you for your purchase of the NTN Linear Feeder.

For correct operation of the NTN Linear Feeder, read this 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. The end user is further requested to store the Instruction Manual carefully in a ready-to-take out place to facilitate ready reference at any time after reading.

#### 1. Before Use












- 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 for this machine. Otherwise, specified performance of the machine may not be obtained.

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## 2. Precaution for Safety

This machine is designed and manufactured for parts feeding equipment based on a concept of trouble-free operation and labor saving, while responsibility on user oneself is also important for 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.

	<b>WARNING</b>	indicates a potentially hazardous situation which, if not avoided, will result in death or serious injury.
	<b>CAUTION</b>	indicates a potentially hazardous situation which, if not avoided, will result in minor or moderate injury or property damage only.
	<b>WARNING</b>	
		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.
		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.
	<b>CAUTION</b>	
		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.)
		<ul style="list-style-type: none"> <li>• 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.</li> <li>• Fix the machine securely after installation.</li> </ul>
		<ul style="list-style-type: none"> <li>• Do not conduct the installation and assembly work with bare hands.</li> <li>• 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></li> </ul>
		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.
		Do not install the body in inclination. The specified performance of the machine may not be ensured.
		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..
		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.

## □ For proper use

- ① NTN linear feeder is a vibrating machine which feeds a part to a specified position in a linear manner with a chute manufactured in accordance with the shape of intended parts. Do not use the machine for purpose other than the above such as equipment for material test or sieve.
- ② Use the NTN linear feeder in conformance to instructions in this operation manual and packaged manual. See the specification in item 10 for technical specification.
- ③ Be sure to use NTN controller for NTN linear feeder. Also, use a controller and power supply compatible with this machine.
- ④ Generated noise level depends on the specification of this machine, material of parts to be fed, etc. When noise level is above acceptable limit, take a noise insulation measure with noise insulation cover, etc.

(Note 1) Do not use the machine when it is not in complete condition (abnormal noise, abnormal vibration, chipped parts, etc).

(Note 2) When a chute is equipped with array mechanism for specified parts to be fed, only such specified parts can be fed.

(Note 3) Environmental condition in use

Ambient working temperature	0~40°C
Ambient working humidity	30~90% (Free from condensation)
Working altitude	Below 1,000m
Storage temperature in transport	-10~50°C
Atmosphere of use place	Not exposed to water, chemical, etc. Free from combustible gas and corrosive gas Use only indoors.

## □ What should be observed by users

- ① Follow the instructions in this operation manual and other manuals in any work such as operation, maintenance, and repair.
- ② Avoid such use that may deteriorate the safety of NTN linear feeder. When any sign of change is found which may harm safety, inform NTN of details.

(Note) NTN linear feeder must be installed, operated, maintained, and repaired by a special expert. Further, make sure that only authorized personnel are in charge of operation.

## 3. Operating Principles

The chute installed on the upper vibrator is connected to the lower vibrator by means of the leaf spring provided at certain angle, and they are vibrated with a magnet, so that works on the chute are thrown upward aslant, resulting in little-by-little advancement of the works.

Large vibration can be generated with small oscillating force, since resonance is made to the suction frequency of the magnet with strength of the leaf spring set properly to the chute mass.





## 6. Transportation and Installation

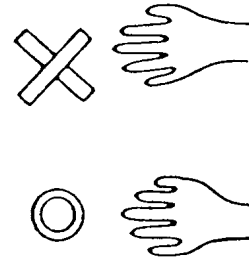
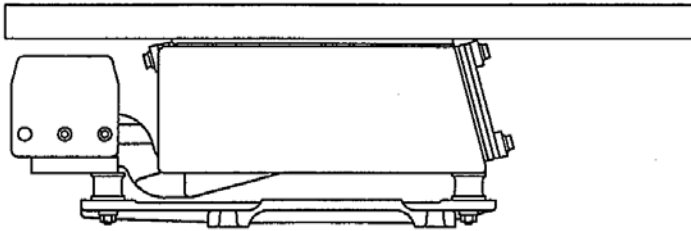


### CAUTION

The body is a heavy material. Transport the body carefully with care not to cause drop.

#### (1) Transportation

Do not transport the body while holding the chute. The chute or leaf spring may be deformed. Make it a rule to hold the base or mount.



#### □ Note in transporting

This machine is a heavy material. Watch out for dropping in transporting and be cautious enough. Especially, S20 and S30 must not be carried by single person. 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 chute if attached).

#### (2) Installation

Fix the base with bolt securely.

Little vibration will be felt when the base is touched in operation, if the machine is installed properly.

#### □ Caution for installation

- ① Be sure to wear safety gloves to prevent the sharp edges of the chute and others from touching bare hand.
- ② Do not operate the machine on a base with insufficient strength or in an unstable place.
- ③ Do not allow the vibrating part of the machine (except the base) to be in contact with some other things in fixing.
- ④ When the machine is inclined in installation, specified capability cannot be obtained. Be sure to level the machine.
- ⑤ When perform welding work or grinding work nearby the linear feeder, protect the linear feeder all over with a protective cover. Incompliance may deteriorate the performance because iron powder etc jumps into the machine.

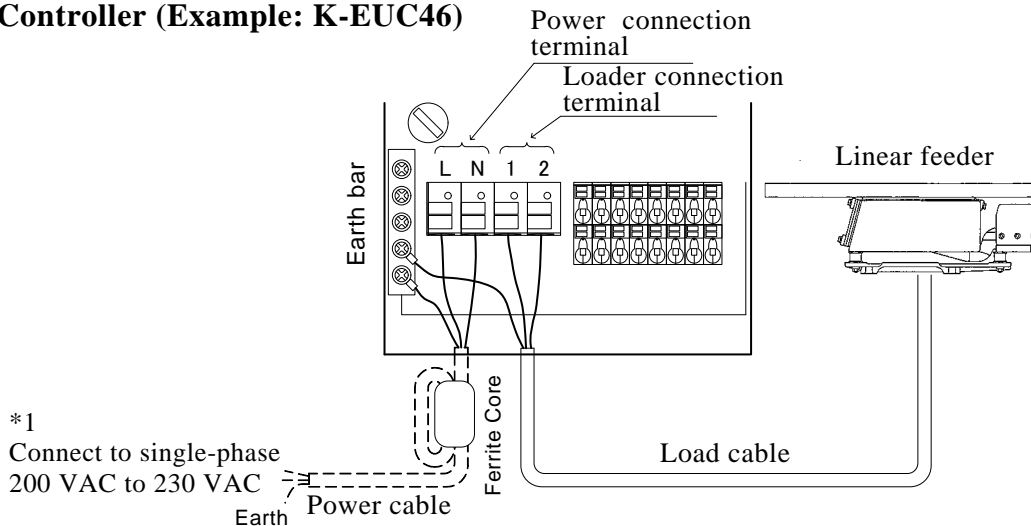
## 7. Wiring and Operating Methods



### 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.

#### Controller (Example: K-EUC46)



\*1

Connect to single-phase  
200 VAC to 230 VAC

Earth

- \*1 In the case of -phase power source, use two phases out of three. Do not use the remaining one phase.
- \*2 Power source cable are not attached to K-EUC46. Those shall be prepared by the vender of wiring work.

- (1) Detach the transporting fixture for chute and linear feeder if any.
- (2) Connect power supply. (See the operation manual of the controller for connection in detail.)
- (3) Turn the speed adjusting knob of the controller counterclockwise to set the graduation at "0".  
(Make sure that the linear feeder is free and in no contact with something around.)
- (4) 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 machine is incorporated to some apparatus, do not open or close the primary side of the controller but use external control input terminal in turning on and off.
- (Note 2) Power connecting work must be performed by personnel in charge of electric engineering. When modifying or changing connection, see the operation manual of controller.
- (Note 3) When a chute that matches with the shape of specified parts is installed, and indication mark is found around the controller speed adjusting knob, set the adjusting knob at corresponding position in use.
- (Note 4) As to the cable, use the lead wire attached to the vibrator. When it is intended to extend the cable for your company, ensure that the extension length is 10 m max. Further, ensure separate grounding, using a grounding wire of 2.5 mm<sup>2</sup> min. in size. In addition, conduct the protective continuity test to ensure that the machine is grounded appropriately.
- (Note 5) See the operation manual of controller in use.

## 8. Inspection and Adjustment

### (1) Adjustment of counterweight

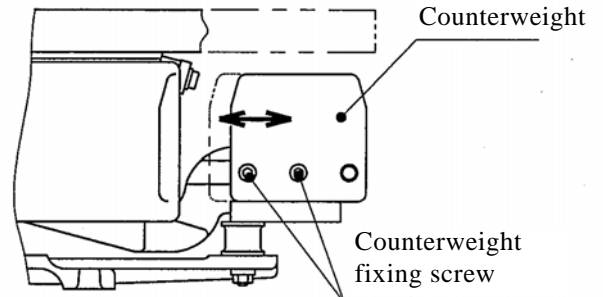


#### Caution

If the counterweight should move beyond the specified movable range, the setscrew may loosen, resulting in dislocation of the counterweight from the mounting area, followed by falling.

If the parts feeding speed is uneven on the front and back on the chute, move the counterweight back and forth for adjusting.

(Note) Tighten the counterweight fixing screw securely. Also make sure that the fixing position of the counterweight is within the moving range shown in item 5 Dimension Drawing on page 4 - 5 (Dimension of \*2).



### (2) Inspection and adjustment of leaf spring

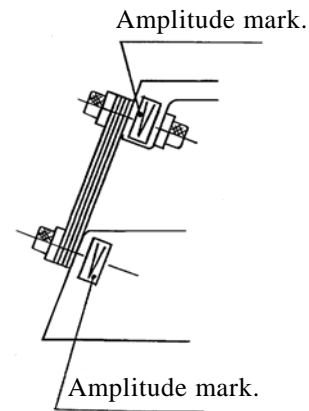
#### ① Acceptable maximum amplitude of leaf spring

Operate the machine with the amplitude below that shown in the following table in order to prevent breakage of leaf spring.

If the machine is used with greater amplitude, the leaf spring may be broken earlier. When measuring the amplitude, affix the attached amplitude mark as shown below, and be sure to sum up the reading of upper and lower amplitude mark.

Model/ Size	Plate spring product number	Amplitude (Upper + Lower)
S10	K-PLS4-40×6	0.7 mm
S20	K-PLS4-70×12	1.4 mm
S30	K-PLS4-86×15	1.8 mm

(Note) When NTN specifies a recommended speed, set the speed adjusting knob of controller at a corresponding recommended graduation.



#### ② Caution in attaching and detaching leaf spring

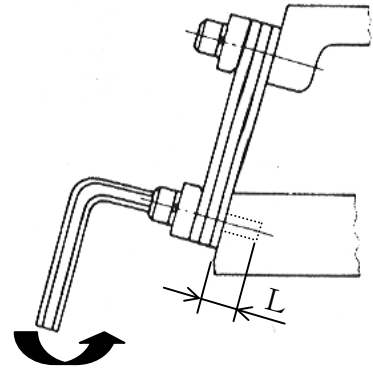
When attaching and detaching the leaf spring, be sure to complete one unit before moving to the next unit. Do not loosen all the units at the same time.

a) Set the fitting depth of bolts (Dimension L includes the depth on upper vibrator side) twice the screw diameter, and change the bolt length when the leaf spring increases or decreases.

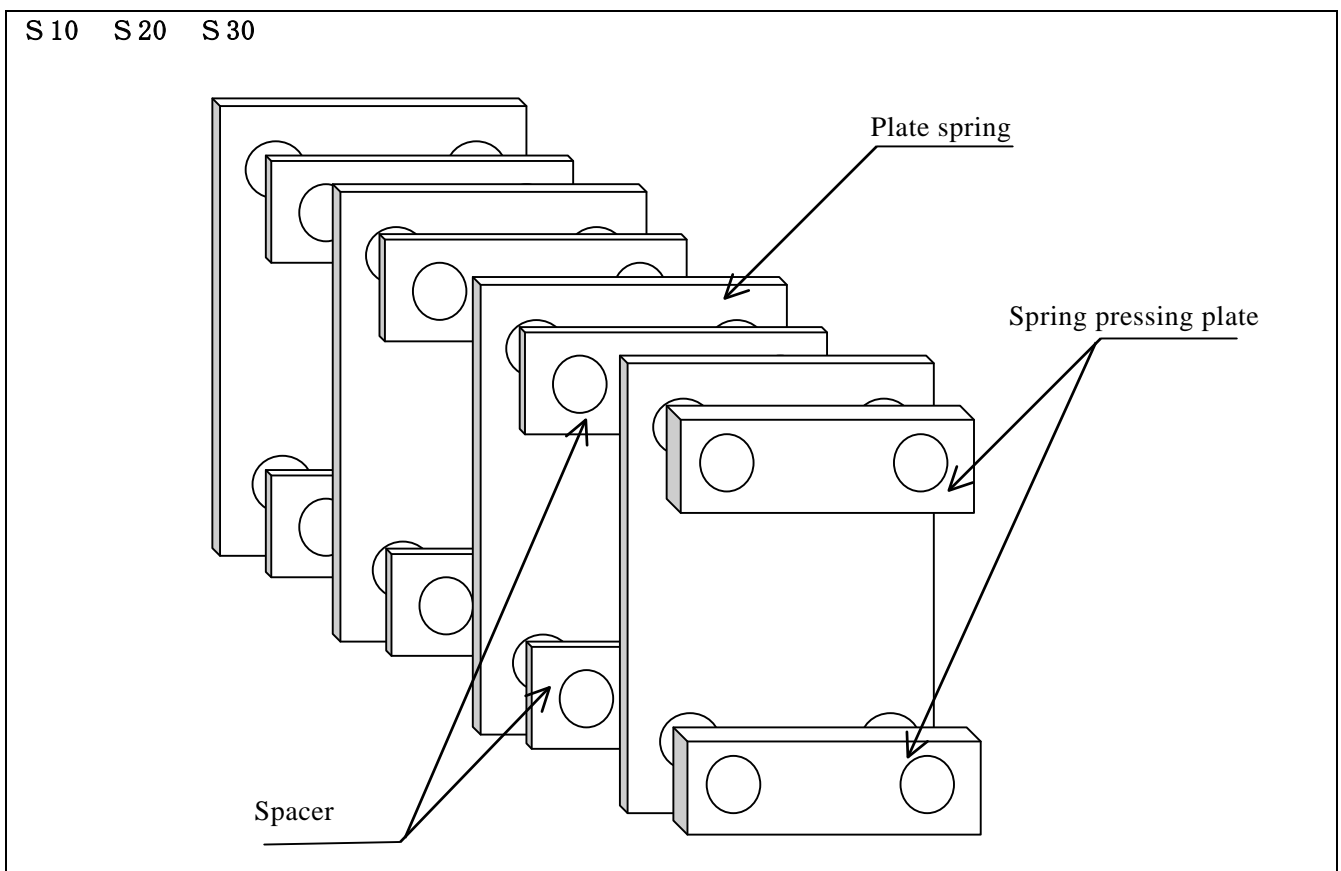
※ Tighten the bolt securely, using the table below for guide of tightening torque.



Model/ Size	Used bolt	Tightening torque
S10 S20	Hexagon socket head bolt M6 (Strength classification 10.9 or above)	Approx 14.7Nm (150 kg f·cm)
S30	Hexagon socket head bolt M10 (Strength classification 10.9 or above)	Approx 68.6Nm (700 kg f·cm)



b) Apply grease or rust preventive oil between leaf springs (between leaf spring and spacer) in assembling.



(Note) Do not sandwich dust, chip, etc between the leaf springs.

### ③ Retightening

Check the leaf spring tap bolt and retighten it after actual operating time of about 40 hours.

When the tightening is normal, there is hardly the additional tightening allowance. But, consider this requirement as retightening of comfortable fitting of the leaf spring.

#### ④ Correction of fatigue

When the machine is operated with the speed adjusting volume set to the MAX. Position at all times, add 1 or 2 pieces of leaf springs to a leaf spring unit in either one place.

When the machine is operated 40 - 100 hours, the spring constant of leaf spring itself is deteriorated by repeated stress by vibration, which slightly reduces the amplitude, although the leaf spring mounting bolt is jointed normally.

#### ⑤ Replacement of leaf spring

100% replacement of leaf springs is recommended with the guideline of 1-year operation on the basis of 8 hours a day.

If amplitude cannot be recovered after correction of set in fatigue described in ④ above, we recommend that you replace all leaf springs, considering that the end of the life of the leaf spring has been reached.

(Note) When a leaf spring is needed newly, purchase one referring to the leaf spring product number in 10. Specifications.

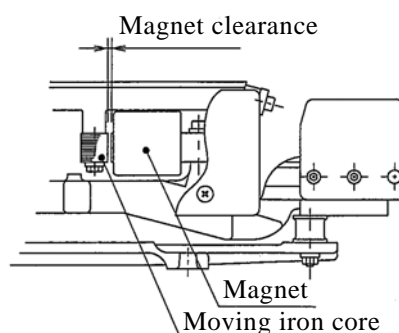
### (3) Check and adjustment of magnet clearance

Clearance between the magnet and moving iron core is set to those described in the table below in shipment of the machine from NTN. It is recommended to make is as small as possible to the extent where they are not in contact in the maximum amplitude, therefore check it from time to time and maintain an appropriate value.

<Adjusting procedure>

- ① Remove the cover. (Allowed only on single side)
- ② Loosen the moving iron core tightening bolt.
- ③ Insert a clearance gauge of the specified dimensions for each body (shown in the following table) into the magnet clearance, push the moving iron core toward the magnet side, and temporarily tighten the moving iron core locking bolt.
- ④ Tighten the moving iron core locking bolt. At that time, take care so that the moving iron core position set in the Step ② may not deviate.
- ⑤ Pull out the clearance gauge. Check the parallelism to and clearance in the magnet.
- ⑥ Fit the cover.

Model/Drive system	Magnet clearance (mm) (Value before shipment)
S10(Full wave)	1.0
S20(Full wave)	1.0
S20(Half wave)	1.5
S30(Half wave)	2.0



**Note 1)** When the machine is used with the magnet clearance increased by 120% min. of the maximum value shown in the table, the magnet may burn. Check the magnet clearance from time to time to keep a proper value.

**Note 2)** When the machine is operated in much dusty atmosphere, such dusts and powders may stick to the magnet to narrow the clearance, possibly leading to generation of unusual noise. Conduct periodic check to remove such deposits.

**Note 3)** No clearance gauge is attached. Purchase a commercial thickness gauge.

#### (4) Change of power supply frequency

NTN linear feeder is adjusted in conformance to the power supply frequency or controller setting frequency in the area of use. Therefore when the power supply frequency, which is drive output frequency, or setting frequency of controller changes, it is impossible to provide normal vibration. Follow the steps below for changing power supply frequency:

(Note) When the drive output frequency is set by variable frequency controller, change of setting is not required even when power supply frequency is changed (50 Hz and 60 Hz).

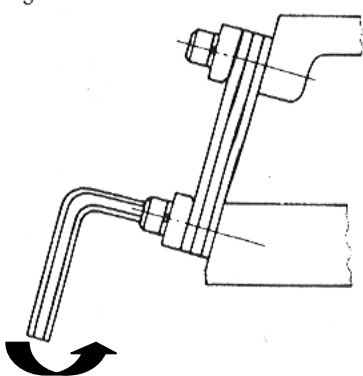
#### Change of number of leaf springs

Power frequency	Linear feeder	
	Adjustment of leaf spring (No. of leaf springs)	Example of adjustment
50 Hz → 60 Hz	Increase by about 40%	In the case of 18 leaf springs in total of the front and rear, the number of leaf springs is adjusted to about 25.
60 Hz → 50 Hz	Decrease by about 30%	In the case of 20 leaf springs in total of the front and rear, the number of leaf springs is adjusted to about 14.

**Note 1)** For details of switching of the controller power frequency, see the Controller Instruction Manual.

**Note 2)** When new leaf springs are required, purchase leaf springs while referring to the leaf spring part No. shown in “10 Specification”.

<Reference: How to check excess and shortage of leaf springs>



When checking whether the leaf springs installed at present are in excess or shortage for the chute, follow the steps below. Slightly loosen only one position of leaf spring tightening bolt during vibration, and check the amplitude.

- Amplitude has increased. → Plate springs are in excess.
- Amplitude has decreased. → Plate springs are in shortage, or appropriate.

It is optimum when sufficient amplitude is provided as well as amplitude decreases when a bolt is loosened.

## 9. Troubleshooting

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

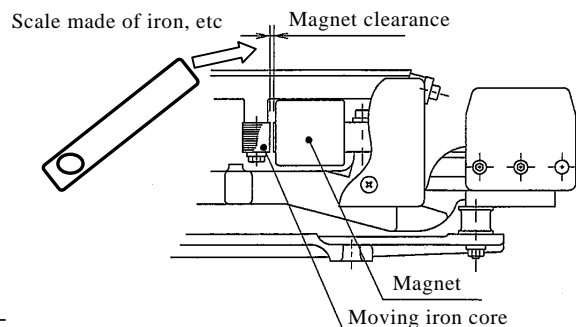
### (1) No vibration at all

In this case, distinguish the trouble between mechanical system and electric system as shown below for checking.

Insert an iron piece to the magnet clearance as shown below with power switch turned on.

#### ① When the piece is sucked in strongly during vibration

Electric system is normal. Therefore, either the setting of leaf spring number on linear feeder has a problem, or the designation of frequency is wrong.



**② When the piece is not sucked in 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 item 7 Wiring and operating method.)
- b) Fuse of controller is not melted, and overcurrent protection function is not active.
- c) External control input terminal (X1 – 0V) of controller is shorted by short-circuit fitting, or is closed by external control. (See the controller operation manual.)
- d) Magnet coil is not broken.

**(2) Vibration is found, although amplitude is insufficient.**

- ① Imperfect power source.  
(such as 100V connection in spite of 200V specification.)
- ② Plate spring mounting bolt is not loosened.
- ③ Tightening bolt of chute etc is not loosened.
- ④ Magnet clearance is not too large.
- ⑤ Omission of removal of fixtures used for transportation.
- ⑥ Too heavy chute mass.
- ⑦ Improper number of leaf springs to the mass of the chute.
- ⑧ Wrong adjustment of frequency of the controller. (In the case of a frequency variable controller)

**(3) Unusual metallic noise.**

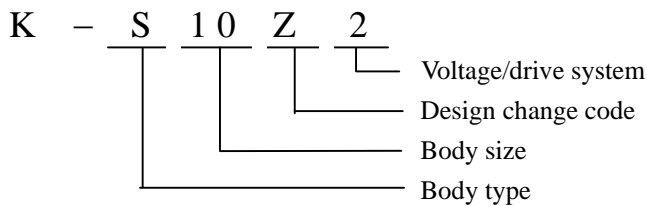
- ① Plate spring is not fatigued.
- ② Plate spring mounting bolt is not loosened.
- ③ Plate spring is not damaged, and rust is not found.
- ④ Foreign substance is not pinched in the magnet clearance.
- ⑤ Chute tightening bolt is not loosened.
- ⑥ Wrong adjustment of frequency of the controller. (In the case of a frequency variable controller)

**(4) Amplitude is decreasing during use.**

- ① Magnet clearance is not so small as to allow contact in vibration. Further, foreign substance is not pinched in the clearance.
- ② Excessive amplitude.
- ③ Omission of removal of fixtures used for transportation.
- ④ Deformed cover interfering with vibrator.

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. Specification



### Relation between voltage/drive system and No. of vibrations

Voltage/drive system			50Hz district	60Hz district
2	200 VAC	Full wave	6,000 times /min	7,200 times /min
4	200 VAC	Half wave	3,000 times /min	3,600 times /min

<Common specifications>

#### Full wave / Half wave

Part No.	K-S10□2	K-S20□ <sup>2</sup> / <sub>4</sub>	D-S30□4
IP Protection rating	IP32	Leaf spring locking bolt strength division	12.9
Cable thickness × length (from center)	Magnet : 1.0 mm <sup>2</sup> × 3 m	Coating	Vibrator: Black Cover: Silver

<Individual specifications>

#### S10 (Full wave)

Part No.	K-S10Z2		K-S10Y2
Drive method	Full wave	No. of vibrations (times/min)	6,000 (50 Hz), 7,200 (60 Hz)
Spring angle	12°	Mounting of leaf spring (places)	2 (front, rear)
Supply voltage (V)	200	No. of standard set pieces	5 pieces × 2 = 10 pieces
Power consumption (VA)	40	Leaf spring Part No. (material)	K-PLS4-40 × 6 (Steel)
Dissipation current (A)	0.2	Leaf spring dimensions (mm) Length (Hole pitch) × Width (") × Plate thickness	54 (40) × 42 (28) × 0.6
Magnet Part No. (No. of magnets used)	K-PMG-121-3 (1 piece)	Leaf spring tightening torque	14.7 N·m {150 kgf·cm}
Max. loading chute length (mm)	600	Max. loading chute mass (kg) ※ Work + Chute mass	2.5 (50 Hz) 2.0 (60 Hz)
Remarks	K-S10Z2 (with base plate)		K-S10Y2 (without base plate)
Mass (kg)	7		5.5

**S20 (Full wave/Half wave)**

Part No.	K-S20Z2	K-S20Y2	K-S20W4	K-S20V4
Drive method	Full wave (Last No. of part No. : 2) Half wave (Last No. of part No. : 4)	No. of vibrations (times/min)		Full wave : 6,000 (50 Hz), 7,200 (60 Hz) Half wave : 3,000 (50 Hz), 3,600 (60 Hz)
Spring angle	15°		Mounting of leaf spring (places)	2 (front, rear)
Supply voltage (V)	200		No. of standard set pieces	9 pieces × 2 = 18 pieces
Power consumption (VA)	Full wave : 100 Half wave : 120	Leaf spring Part No. (material)		Full wave : K-PLS4-70 × 12 (Steel) Half wave : K-PLS4-70 × 9 (Steel)
Dissipation current (A)	Full wave : 0.5 Half wave : 0.6	Leaf spring dimensions (mm) Length (Hole pitch) × Width (") × Plate thickness		Full wave : 88 (70) × 50 (35) × 1.2 Half wave : 88 (70) × 50 (35) × 0.9
Magnet Part No. (No. of magnets used)	K-PMG-221-3 (1 piece)		Leaf spring tightening torque	14.7 N·m { 150 kgf·cm }
Max. loading chute length (mm)	800		Max. loading chute mass (kg) ※ Work + Chute mass	5.0 (50 Hz) 3.5 (60 Hz)
Remarks	K-S20Z2, K-S20W4 (With base plate)		K-S20Y2, K-S20V4 (Without base plate)	
Mass (kg)	14		11.5	

**S30 (Half wave)**

Part No.	K-S30Z4	K-S30Y4		
Drive method	Half wave	No. of vibrations (times/min)	3,000 (50 Hz), 3,600 (60 Hz)	
Spring angle	15°		Mounting of leaf spring (places)	2 (front, rear)
Supply voltage (V)	200		No. of standard set pieces	5 pieces × 2 = 10 pieces
Power consumption (VA)	180		Leaf spring Part No. (material)	K-PLS4-86 × 15 (Steel)
Dissipation current (A)	0.9		Leaf spring dimensions (mm) Length (Hole pitch) × Width (") × Plate thickness	106 (86) × 80 (50) × 1.5
Magnet Part No. (No. of magnets used)	K-PMG-321-6 (1 piece)		Leaf spring tightening torque	68.6 N·m { 700 kgf·cm }
Max. loading chute length (mm)	1,100		Max. loading chute mass (kg) ※ Work + Chute mass	15
Remarks	K-S30Z4 (with base plate)		K-S30Y4 (without base plate)	
Mass (kg)	41		33	

**Note 1)** For clearance in the magnet, refer to “Check and adjustment of clearance in magnet” on page 10.

**Note 2)** In case of special specifications (such as voltage, frequency and part material), refer to individual manuals.

**[Applicable standards]**

Harmonized standards of European low voltage directive : EN61010-1 : 2010

Harmonized standards of North America U.S.A. : UL 61010-1 : 2012

Canada: CAN/CSA-C22.2 61010-1-12

(NRTL certification: TUV Rheinland of North America Inc. Certification No.: CU 72122179)

European EMC directive: EN61000-6-4:2007

EN61000-6-2:2005

See the operation manual of the controller K-EUC46 for EMC in detail.

## [MEMO]

### NTN Parts Feeder Warranty Card

The warranty card is attached to the product. Be sure to receive the warranty card when you purchase the product.

The warranty card assures you of our free repair of the product in accordance with the conditions specified in the card. Be sure to store the warranty card carefully after checking those specified in the card.

- The content of this instruction manual is subject to change without prior notice due to functional improvements.

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