



# Operating instructions

## Linear feeder

**GL 1**  
**GL 01**

BA

Rhein-Nadel Automation GmbH

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Declaration of conformity  
as defined by  
Low voltage directive 2006/95/EC

Herewith we declare that the product complies with the following provisions:  
Low voltage directive 2006/95/EC

applied harmonized standards:                   DIN EN 60204 T1

remarks:

We assume that our product is to be integrated in a fixed machine. The provisions of the EMC directive 2004/108/EC has to be considered by the user.

Rhein-Nadel-Automation

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Managing Director  
Jack Grevenstein





## Notice

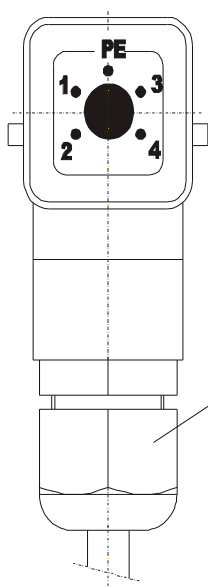
All linear feeders listed in the table may only be operated in connection with a RNA control unit at a mains voltage of 230V/50Hz. Special voltages and frequencies see separate data sheet.

## 1 Technical data

Linear feeder type		GL 01	GL 1
Dimensions L x W x H	in mm	245 x 58 x 100	400 x 105 x 100
Weight	in kg	3,8	8,7
Insulation type		IP 54	IP 54
Connecting cable length	in m	1,4	1,4
Power consumption (1)	in VA	120	173
Current consumption (1)	in A	0,6	0,865
Magnet nominal voltage (1)/Frequency	in V/Hz	200/50	200/50
Number of magnets		1	1
Magnet type		WZAW040X00D05	WZAW060X00D25
Magnet colour		black	black
Air gap	in mm	1,5	1,0
Vibration frequency	in Hz	100	100
Number of spring assemblies		2	2
Standard no. of springs		2 x 4	2 x 5
Number per spring assembly			
Spring dimensions	in mm	45(35)x25(15)	87(67)x20
Length (gauge for boreholes) x width			
Spring size	in mm	0,5	1,5
Quality of the spring fastening screws		8,8	8,8
Tightening moment of the spring fastening screws	in Nm	8	35
Max. weight of the oscillating units (linear track) depending on the mass moment of inertia and required running speed approx.kg	in kg	approx. 1-2,5	approx. 2-4
Max. track length	in mm	400	600
Maximum useful weight of the linear feeder	in kg	3	5

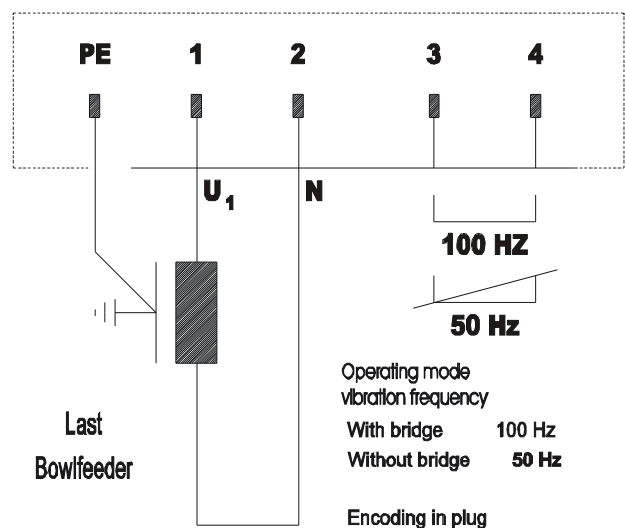
(1) At special connecting values (voltage/frequency) see type plate at the magnet

## Pin assignment



Screw connection M20  
Grey-2, 100 Hz

Black-1, 50 Hz  
Metal-EMV-screw connection  
For frequency controlled equipment



The bridge has to be installed in connection  
3+4

## 2 Safety instructions

The conception and production of our linear feeders has been carried out very carefully, in order to guarantee trouble-free and save operation. You too can make an important contribution to job safety. Therefore, please read this short operating instruction completely, before starting the machine. Always observe the safety instructions!

Make sure that all persons working with or at this machine carefully read and observe the following safety instructions!

This operating instruction is only valid for the types indicated on the front page.



### Notice

This hand points to information that gives you useful tips for the operation of the linear feeder.

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### Attention

This warning triangle marks the safety instructions. Non-observance of these warnings can result in serious or fatal injuries!

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### Dangers occurring at the machine

- Make sure that the protector ground of the electric power supply is in perfect condition!
- Operation of the linear feeder without trim panel is strictly prohibited!

### Proper use

The intended use of the linear feeder is the actuation of conveying tracks. These are used for linear transport and feeding of correctly positioned mass-produced parts, as well as for the proportioned feeding of bulk material.

The intended use also includes the observance of the operating and servicing instructions.

Please take the technical data of your linear feeder from the table "technical data" (see chapter 1). Make sure that the connected load of the linear feeder, control unit and power supply is compatible.



### Notice

The linear feeder may only be operated in perfect condition!

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The linear feeder may not be operated in the explosive or wet area.

The linear feeder may only be operated in the configuration drive unit, control unit and oscillating unit, as specified by the manufacturer.

No additional loads may act upon the linear feeder, apart from the material to be transported, for which the special type is designed.



### Attention

It is strictly prohibited to put any safety devices out of operation!

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### Demands on the user

- For all activities (operation, maintenance, repair, etc.) the details of the operating instructions must be observed.
- The operator has to avoid any working method which would impair the safety of the linear feeder.
- The operator must take care that only authorized personnel works at the linear feeder.
- The operator is obliged to inform the operator immediately about any changed conditions at the linear feeder that could endanger safety.



#### Attention

**The linear feeder may only be installed, put into operation and serviced by expert personnel.**  
The binding regulation for the qualification of electricians and personnel instructed in electrical engineering is valid, as defined in IEC 364 and DIN VDE 0105 part 1.



#### Attention:

Since the electromagnetic-field may have an impact on persons carrying pacemakers it is recommended to keep a minimum distance of 25 cm.

### Noise emission

The noise level at the place of operation depends on the complete equipment and the material to be sorted. The determination of the noise level according to the EC-Regulations "Machinery" can therefore only be carried out at the place of operation.

If the noise level at the place of operation exceeds the limit permitted, noise protection hoods may be used, which we offer as accessory parts (see catalogue).

### Applicable Directives and Standards

The linearfeeder has been built in accordance with the following directives:

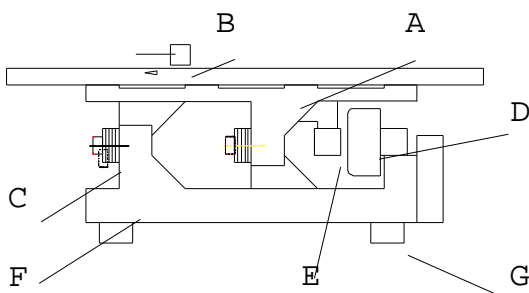
- EC Low Voltage Directive 2006/95/EC
- EMC Directive 2004/108/EC

We assume that our product will be integrated in a stationary machine. The user is to observe the regulations of the EMC Directive.

Please refer to the Declaration of Incorporation for the applicable standards.

### 3 Construction and function of the linear feeder

Linear feeders are used for the actuation of sorting machines. The actuation takes place by electromagnets. The following schematic diagram shows the function of a linear feeder:



- A *Conveying track and oscillating weight*
- B *Material to be conveyed*
- C *Spring assembly*
- D *Drive magnet*
- E *Armature*
- F *Counter-mass*
- G *Vibration buffers*

The linear feeder is a device of the family of vibratory bowl feeders. It is, however, equipped with a linear conveyor. Electromagnetic vibrations are converted into mechanical vibrations and are used for conveying material B. When the magnet D, which is fixedly connected with the counter-mass F, is supplied with current, it generates a power that, dependent on the vibration frequency of the mains supply, attracts and releases armature E. Within a period of the 50 Hz of the A.C. network the magnet achieves its maximum power of attraction twice, as this is independent of the direction of the current conduction. The vibration frequency therefore is 100 Hz.

A linear feeder is a resonant system (spring-mass-system). The result is that the adjustment made at the plant will rarely meet your requirements. Chapter 5 describes how your linear feeder is adapted to your requirements.

Controlling of the linear feeder takes place by a low loss electronic control unit type ESG 90. The control unit of the linear feeder is separately delivered. At its front panel it is provided with a 5-pole plug-in connection, by which it is connected to the linear feeder.

The pin assignment of the socket is shown in the table "technical data" (chapter 1).



#### Notice

Detailed information on the complete range of control units may please be taken from the operating instructions for control units

All control units have got two main operating elements:

- By the **main switch** the linear feeder is switched on or off.
- By the **turning knob** the conveying caacity of the sorting unit is set.

**Frequency controller** can also be used for tuning vibratory linear feeders: Exact tuning instructions can be found in our operating instructions for frequency control units.

## 4 Transport and mounting

### Transport



#### Notice

Take care that the linear feeder cannot dash against other things during transport

The weight of the linear feeder is taken from the table „technical data“ (chapter 1.)

### Mounting

The linear feeder should be mounted on a stable substructure (available as accessory part) at the place where it is used. The substructure must be dimensioned in a way that no vibrations of the linear feeder can be carried away. Linear feeder are fastened to the vibration buffers from below (part G in the general drawing chap. 3). The following table give you a summary of the bore date of the various types:

Linear feeder type	Length in mm	Width in mm	Vibration buffer thread
GL 01	152	40	M4
GL 1	285	70	M6

Table bore data

Make sure that the linear feeder cannot come into contact with other devices during operation. Further details on the control unit (bore plan, etc.) are please taken from the operating instructions of the control unit separately delivered.

## 5. Starting

### Preparations



#### Notice

Ensure that the frame ( stand, base, frame etc.) is connected with the ground wire. (PE) If necessary, predection earthing on spot should be provided.

Check, whether

- the linear feeder stands in an isolated position and does not come in contact with a solid body
- the linear track is fixedly screwed down and adjusted
- the connecting cable of the linear feeder is plugged in at the control unit.



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**Attention**

The electric connection of the linear feeder may only be made by trained personnel (electricians)! In case modifications are made at the electric connection, it is absolutely necessary to observe the operating instructions "control units".

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- The available supply voltage (frequency, voltage, output) is in accordance with the connection data of the control unit (see type plate at the control unit).

Plug in the mains cable of the control unit and switch on the control unit by the mains switch.



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**Notice**

At linear feeders which are delivered as a completely adjusted system, the optimal conveying capacity is already set in the factory. It is marked on the scale of the turning knob with a red arrow. In this case set the turning knob to the marking

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The optimal operative range of the linear feeder is at a controller position of 80% at the control unit. In case of higher deviations ( $\geq \pm 15\%$ ) a new adjustment must be made.

**Adjustment of the running behaviour**

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**Notice**

At first a rough adjustment of the conveying speed (adjustment of the natural frequency must be made. After that the adjustment of the running behaviour. Finally you adjust the conveying speed (natural frequency).

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In order to convey the material with its highest (maximum) conveying speed, it must optimally rest on (in) the track, which means that the vertical amplitude should be zero, if possible. At long tracks the vertical amplitude can be too high, owing to the deflection of the track. The material to be conveyed then makes little jumps on the track and cannot be transported at all or only with low speed.

In exceptional cases it may become necessary to compensate the fluttering of the track at the ends by modifying the counter-weight. In case the workpieces make little jumps at the discharge side or in case the material to be conveyed runs backward, the counter-weight must be increased (stepwise by approx. 50 g). In case the workpieces make little jumps at the feeding side (magnet side) or if there is no conveying movement at the discharge side, the counter-weight must be decreased.

**Adjustment of the natural frequency**

In case the linear feeders are delivered without track, they have been adjusted in the plant to average weights of the oscillating elements. In order to guarantee an optimal conveying behaviour, the linear feeder must be adjusted to the definite operating conditions.

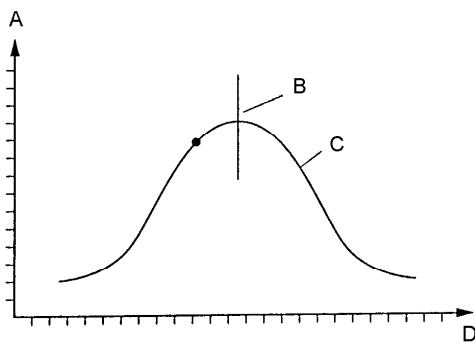
The adjustment is made by adding or removing leaf springs and washers.

First check, whether the right control unit (frequency, voltage, power supply, (see table "technical data" in chapter 1) has been connected.

Carry out the following steps:

- Screw off the side panels. Tighten all spring fastening screws and track fastening screws. Please take the tightening moments of the spring fastening screws from the table technical data (chapter 1).
- Check, whether the magnet corresponds to the specifications in the "technical data" (voltage, frequency).
- Measure the magnet-air gap. In case it differs from the specifications in the "technical data", adjust it correctly.
- Fill the tracks with material to be conveyed and turn the turning knob of the control unit to 90 % of the conveying capacity.
- Loosen a fastening screw at one of the spring assemblies
- (approx. 1/4-1/2 rotation).

While the spring fastening screw is loosened, you can see a change in the conveying speed. The following graphic chart shows the resonance curve of a linear feeder:



- A Conveying speed
- B Resonant frequency of the system
- C Resonance curve (not true to scale)
- D Spring power



**Notice**

The resonant frequency of the linear feeder may not correspond to the mains frequency

In case the conveying capacity decreases after loosening the spring fastening screw, proceed as described under **point 5.1**.

In case, however, the conveying capacity, increases, proceed as described under **point 5.2**.



**Notice**

The adjustment is, however, more easy with an electronic frequency converter, which you can buy from our range of accessory parts.

The linear feeder should be adjusted that the required conveying capacity is achieved at a controller position of approx. 80% at the control unit.

**5.1 The conveying speed decreases?**

Mount additional springs (with distance plates). Start with one additional spring (with washer) at one spring assembly. In case the conveying speed still decreases, although an additional fastening screw is loosened, install one additional spring in each individual spring assembly (one after the other).

**5.2 The conveying speed increases?**

Remove the springs. First remove one spring (with washer) from a spring assembly. In case the conveying speed still increases, although an additional fastening screw is loosened, remove one spring from each individual spring assembly (one after the other).



**Notice**

The side plates must always be mounted for test runs



**Notice**

At a turning knob position of 100 % at the control unit and correctly adjusted magnetic gap the magnet may not dash against the armature when switching on the device.

**The aim of the adjustment is:**

If the required conveying speed is achieved at a controller position of 80 %, the conveying speed must always decrease when the spring fastening screw is loosened.



**Notice**

Take care that the number of springs per spring assembly does not differ by more than 2-3 springs.

After removing and mounting of the leaf springs the linear feeder must be readjusted.

**Adjustment of the linear feeder type GL 01:**

Tighten the spring fastening screws with the specified tightening torque (see "technical data" chapter 1). Control and keep to the mounting dimension (oscillator height) of 85 mm at all four edges of the linear feeder. Before starting the side plates must be mounted.

## Adjustment of the linear feeder type GL 1:

For the adjustment of the oscillator in parallel to the counter-mass four leaf springs are included in the delivery. These leaf springs must be inserted between the spring assemblies and the distance cams (one each above and below). After that the spring fastening screws must be tightened with the specified tightening torque (see "technical data" chapter 1). Before starting the distance springs must be removed and the side plates must be mounted.

## 6 Specifications for the design of the track

The projection of the track in longitudinal direction towards the oscillator should be at a ratio of **1/3 feeding side to 2/3 discharge side**.

The tracks must be of solid construction. upright beams with a high moment of resistance are to be preferred (U-beams, rectangular tubes, etc.).

Especially tracks for thin material as eg. stamped metal parts, etc. should be manufactured with the greatest possible clearance between material to be conveyed and cover. Here it must, however, be guaranteed that the material to be conveyed does not run one piece on top of the other or becomes wedged together.

The track should be located in the middle of the oscillator. By no means it may be installed in a way that one side projects over the oscillator.

## 7 Maintenance

The linear feeders are generally maintenance-free. They should, however, be thoroughly cleaned when they are considerably dirty or after fluids have been spilled over them.

- For that first unplug the mains plug.
- Remove the side plates.
- Clean the inside of the linear feeder, especially the magnetic gap.
- After mounting the side plates and plugging in the mains plug, the linear feeder is ready for operation again.

## 8. Stockkeeping of spare parts and after-sales service.

The range of the spare parts available may be taken from the separate spare parts list.

In order to guarantee quick and faultless handling of the order, please always state the type of equipment (see type plate), number of pieces needed, spare part name and spare part number.

You will find a list of our service addresses on the back page of the cover

## 9 What is to do, if...

### Instructions for trouble-shooting



#### Attention

The control unit or the connecting terminal box may only be opened by an electrician. Before opening the a.m. devices, the mains plug must be unplugged!

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Trouble	Possible cause	Remedy
Linear feeder does not start when being switched on	<p>Mains switch off</p> <p>Mains plug of the control unit is not plugged in</p> <p>Connecting cable between linear feeder and control unit is not plugged in</p> <p>Fuse in the control unit defective</p>	<p>Switch on the mains switch</p> <p>Plug in the mains plug.</p> <p>Plug in the 5-pole plug at the control unit</p> <p>Replace the fuse</p>
Linear feeder vibrates slightly	<p>Turning knob at the control unit is set to 0%</p> <p>Wrong vibration frequency</p> <p><b>Attention:</b> in case a linear feeder for 6000 vibrations/minute is operated with a 5-pole plug without bridge, the control unit and the magnet is in danger!</p>	<p>Set the controller to 80%.</p> <p>Check, whether the code in the plug of the linear feeder is correct (see type plate and "technical data" (chap. 1)</p>
After a longer operating time the linear feeder does no longer come up to the conveying capacity required	<p>Fastening screws of the linear track have worked loose</p> <p>Screws at one or two spring assemblies have worked loose</p> <p>Magnetic gap misadjusted</p> <p>Springs are broken</p> <p>Oscillator has displaced itself towards the counter-mass</p>	<p>Retighten the screws.</p> <p>Tighten the screws (tightening torques see "technical data" (chapt. 1)</p> <p>Replace the broken springs</p> <p>Readjust the oscillator (see chapt. 5)</p>
Linear feeder produces loud noise	<p>Fastening screws of the side plates have worked loose</p> <p>Foreign bodies in the magnetic gap</p>	<p>Retighten the screws</p> <p>Switch off the linear feeder and remove the foreign bodies, after that check the magnetic gap adjustment</p>
Linear feeder cannot be adjusted to a constant conveying speed	<p>The spring constant of the oscillating system has changed. The linear feeder works close to the resonance point</p>	<p>Readjust the linear feeder. Springs must be removed. See chapt. 5, adjustments</p>



(D)

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