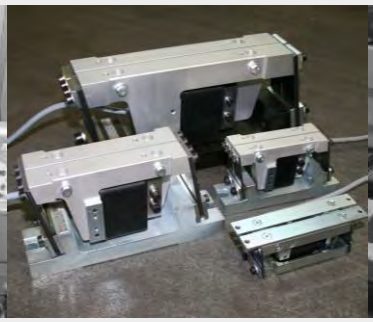
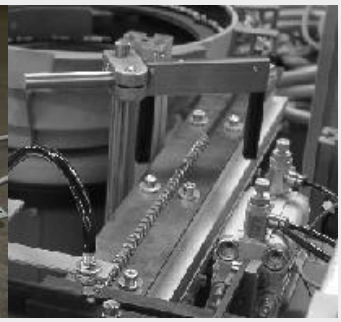




Operating instructions

Linear Feeders

SLS 250
SLS 400
SLS 600
SLS 800

BA

Rhein-Nadel Automation GmbH

TABLE OF CONTENTS:

Declaration of conformity
as defined by
Low voltage directive 2014/35/EU

Herewith we declare that the product complies with the following provisions:

Low voltage directive 2014/35/EU

applied harmonized standards: DIN EN 60204 T1

remarks:

We assume that our product is to be integrated in a fixed machine.

Rhein-Nadel-Automation

Managing Director
Jack Grevenstein

CE

1.Safety information

1.1 Basic safety information

Familiarity with these basic safety rules and regulations constitutes the fundamental prerequisite for safe handling and trouble-free operation of RNA SLS linear feeders.
These operating instructions contain the most significant regulations for safe SLS operation. These operating instructions - and in particular the safety regulations - must be observed by anyone working on and with the SLS.
The applicable on-site accident prevention rules and regulations must also be observed.
These operating instructions must always be kept handy where the SLS is operated.
Further to these operating instructions, generally applicable as well as local accident prevention regulations and environment protection standards must also be kept handy and be observed.

1.2 Obligations to be met by the operator

The operator is obliged to authorise only those persons to work with the SLS linear feeder who are familiar with the basic work safety and accident prevention standards and who have been trained in SLS operation. Furthermore, these persons must confirm with their signature that they have read and understood the chapter on safety and the warnings contained in these operating instructions. Steps are to be taken at regular intervals to monitor and document that all personnel are performing their work in a safety-conscious manner.

1.3 Operating personnel training

Only trained and instructed personnel is permitted to work on the SLS.
The scope of responsibilities of personnel entrusted with SLS assembly, commissioning, adjustment, maintenance and repair must be clearly defined.
Personnel still to be trained must work on the SLS only under the supervision of an experienced operator.

1.4 Dangers in handling the unit

RNA SLS linear feeders are state-of-the-art equipment designed in compliance with the EU Machinery Directive and accepted safety regulations. Nevertheless, however, risks may arise from using this equipment that may endanger life and limb of user or third parties and cause interference with the SLS or other material assets.
The SLS must be used only as intended and in perfectly safe condition.
Any malfunctions that may have an adverse effect on the safety of any persons, the SLS or other material assets must be eliminated without delay.

1.5 Appropriate use

The SLS is intended exclusively for the incoming and outgoing transport of components and can also be used for component sorting. Due to its open connector design, the SLS must not be used in areas where readily flammable or explosive media are present.
For maximum permissible dimensions and weights of add-on components, observe details in chapter 3, table 1, *Technical data,* and chapter 4, *Installation instructions*.
Any other use, or use beyond the above specifications, shall be deemed as inappropriate. RNA GmbH shall not accept any liability for any damage incurred through non-observance of this clause.
Appropriate use also includes observation of all Notes in these operating instructions.

1.6 Safety measures for normal operation

The SLS must be operated only if it is in perfectly safe condition. This must be checked at least once per shift.
Check the correct air gap setting in particular after adjustment activities. For further details refer chapter 5.3, Setting the air gap.

1.7 Hazards caused by electrical power

Any work on the power supply must be performed by a qualified electrician. The SLS electrical equipment must be checked regularly. Any loose connections and cables scorched or otherwise damaged must be replaced immediately.
The SLS nameplate specifies the mains supply.

W A R N I N G :
The linear feeder must be operated only at the mains supply specified on the nameplate

1.8 Specific danger points

The SLS, and in particular the built-in electromagnet, must not be operated in liquids. The linear feeder must be installed and the drive supply cable be laid in such a way that no liquid can collect at the cable seal-in point at the magnet. Start the SLS only once this has been ensured. The electrical supply must be interrupted immediately if liquid is suspected to have penetrated the magnet. Due to their open connector design, RNA linear feeders must not be used in hazardous areas.

1.9 Structural modifications

The SLS must not be modified, extended or altered without the manufacturer's approval. Exceptions to this rule are the tracks described in chapter 4.2, Linear- *tracks*, and chapter 4.3, *Flexible add-on solutions*, and the accessories listed in chapter 8, *Accessories.*
Any other alterations are subject to the written approval of RNA GmbH.
Any unacceptable components must be replaced immediately. Use only original spares for this purpose. There is no guarantee that third-party parts have been designed and manufactured in accordance with the applicable stress-bearing and safety standards. Failure to observe this clause cancels the warranty on the linear feeder.

2. Application

RNA SLS linear feeders are used to transport work pieces away from upstream or towards downstream machines. Once various different criteria have been taken into account, RNA linear feeders may also be used to sort components.
The linear feeders may be integrated into individual feeder stations and complex automated assembly systems.

RNA linear feeders are designed to transport work pieces and must not be used for any other purposes (vibrator, vibrating mixer, etc.). Due to their open connector design, RNA linear feeders must not be used in hazardous areas.

Operators of RNA linear feeders must not modify the equipment design. It is vital that special applications be coordinated with RNA GmbH**.**

Note :
Failure to observe these operating instructions while operating an RNA linear feeder cancels the warranty.

The various linear feeder types differ in size and range of applications (refer chapter 3, Equipment description*,* and chapter 4.3, table 3, Recommended values for maximum work piece widths).

3. Equipment description

The SLS consist of two push-pull vibrating sections arranged next to each other. These are connected via bifurcated leaf springs to a common base plate where the opposing vibration forces are virtually cancelled out. Optionally, each of the vibrating sections can operate as useful or counter mass. Another option is to operate both as useful masses (refer chapter 4.3, *Flexible add-on solutions).*
A magnet system (armature - magnet core) is built in horizontally between the two vibrating sections.
The advantages of SLS linear feeders are based on the adjustable balancing of useful and counter masses that largely eliminates the free vibration forces directly within the unit.

Figure 1: Dimensions SLS 250

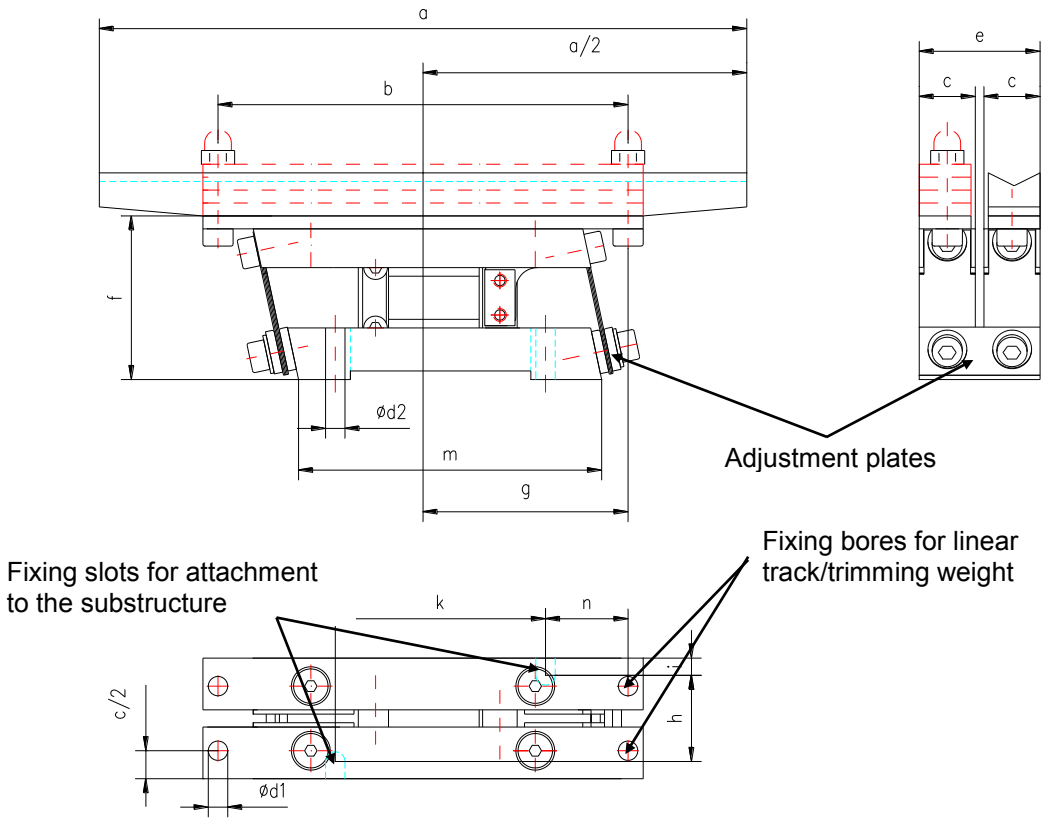


Figure 2: Dimensions SLS 400 – 800

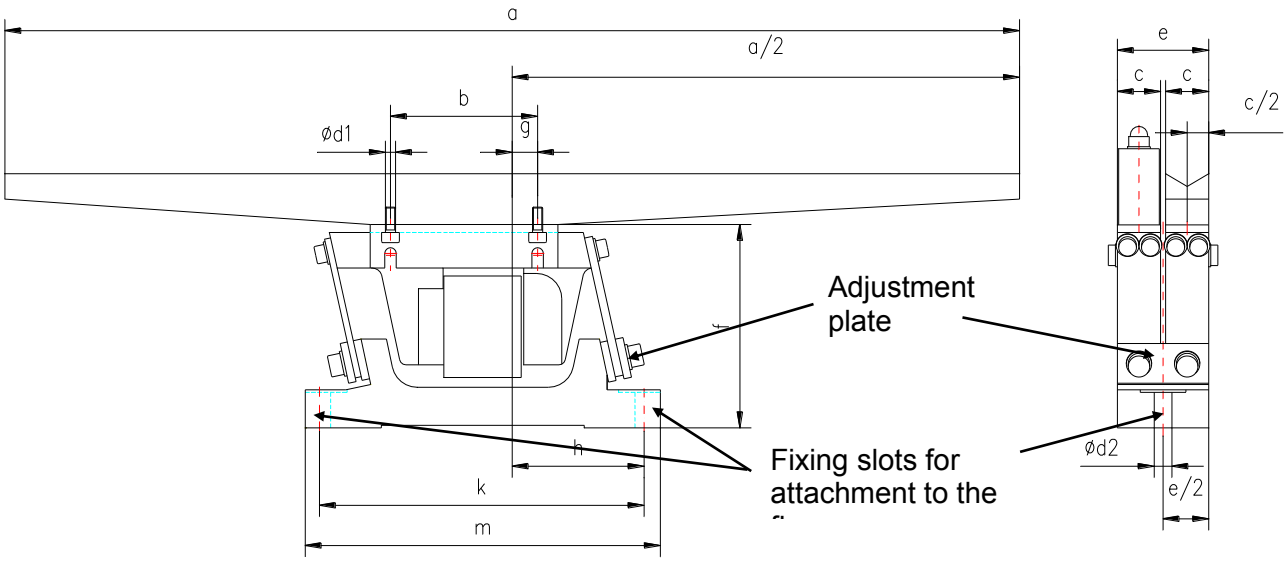


Table 1: Technical data

		SLS250	SLS400	SLS600	SLS800
Main dimensions [mm]	a	150-250	200-400	300-600	500-800
	b	122	58	85	150
	c	17	17	24	29
	ød1	4.5	4.5	5.5	6.6
	ød2	4.5	7	9	10
	e	36	36	50	60
	f	49	79.7	111.7	139.7
	g	56	10	30	45
	h	28	52	88	133
	i	4	-	-	-
	k	75	128	177	283
	m	90	140	200	300
	n	17.3	-	-	-
Max. weight - feed rail [kg]		0.3	0.65	1.8	3.0
Weight - basic unit (kg)		0.7	1	2	7
Vibration frequency [Hz]		Double mains frequency			
Power supply [V/Hz]		230/50 or 110/60			
Max. power consumption [VA]		10	15	25	60
Degree of protection		IP 54			

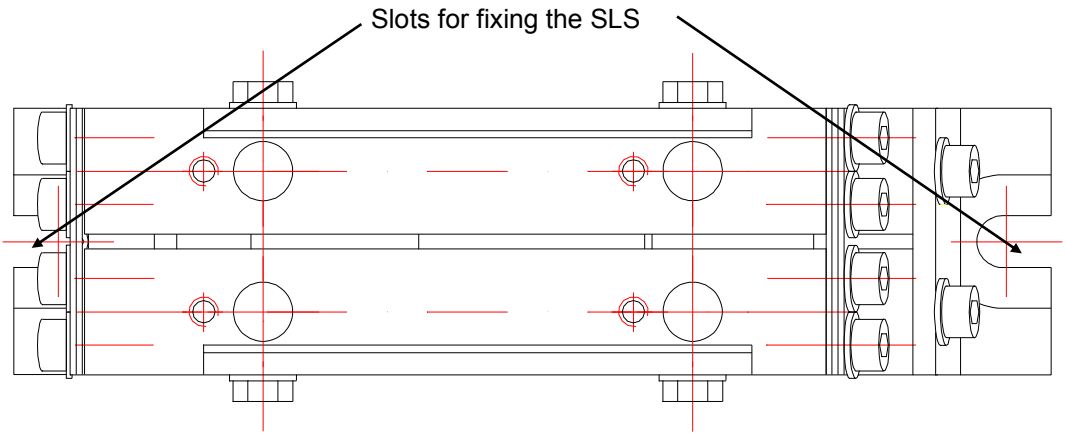
Various different sizes are available to suit individual application and spatial requirements (refer table 1). The main decision-making criteria, above all, are the useful / counter masses and the space available for installation. RNA linear feeders are available with 230V / 50Hz and 110V / 60Hz magnets. RNA also offer a range of controllers for the linear feeders

4. Installation instructions

4.1 Installing the unit

With the help of the slots in the base plate, the SLS is firmly screwed to the floor (refer Fig. 3). This allows for exact definition and adjustability of the junction points at the linear track intake and outlet. In the horizontal plane the floor should be non-yielding (plate or block construction) to absorb any residual forces in this plane. Any overhanging profiled structures must be reinforced with a plate to which the linear feeder will be attached. Best suited for this purpose is a steel plate at least 20mm thick and more than 120mm wide.
Impacting decisively on floor vibration, vertical vibration forces can be virtually eliminated through careful mass balancing (refer chapter 5.1, Balancing the masses).
Suitable substructures must be provided for height adjustment.
Suitable RNA standard parts are available for complete station extensions in combination with RNA bowl feeders.

Figure 3: Attachment slots in the base plate



4.2 Li

The lir ıre fully
transfe ect the
transp eferred
materi should
adhere
The fo

$$\frac{Height}{Width} = \frac{2}{1}$$

The recommended dimensions are listed in table 2. The dimensions are for one vibrating section and can be applied to each of the two vibrating sections.

Table 2: *Linear track dimensions*

	SLS250	SLS400	SLS600	SLS800
Length	250 mm	400 mm	600 mm	800 mm
Width	17 mm	17 mm	24 mm	29 mm

4.3 Flexible add-on solutions

4.3.1 Attaching one linear track

The linear track is attached to either vibrating section with the help of an angle bracket or a lateral plate (refer Figs 4 and 5). In the case of the SLS250, the linear track is attached directly to the vibrating section (refer chapter 3, Fig. 1). In any case, make sure to observe the correct attachment position as per chapter 3, Figs 1 and 2. Any deviations may adversely affect floor vibration.

Figure 4: Linear track mounted with angle bracket

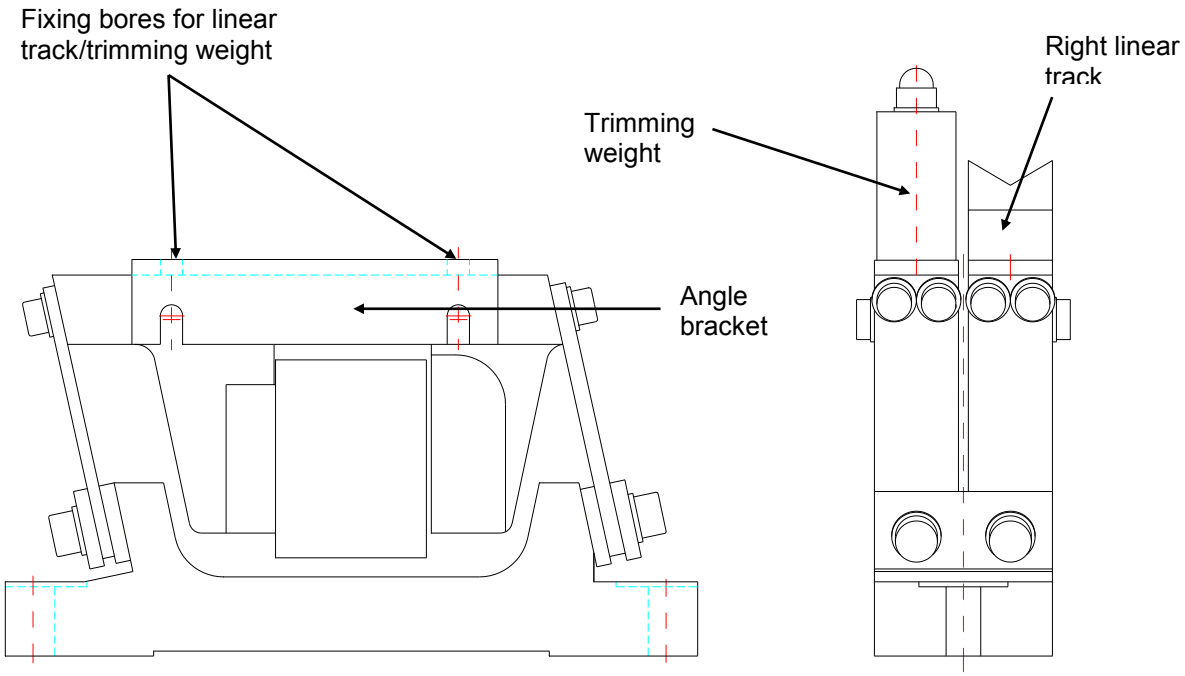
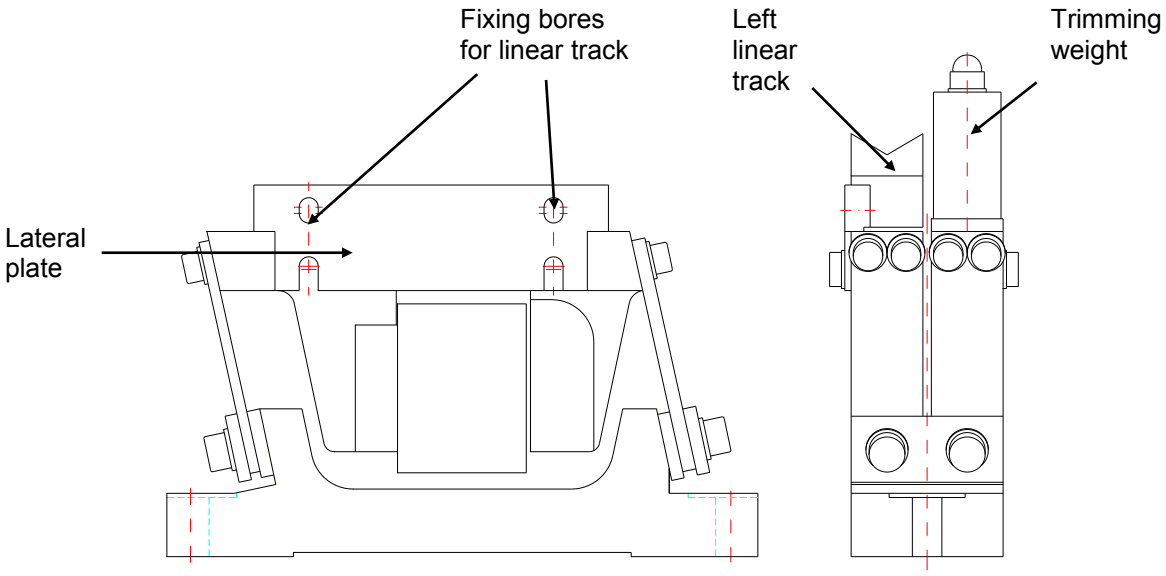


Figure 5: Linear track mounted with lateral plate



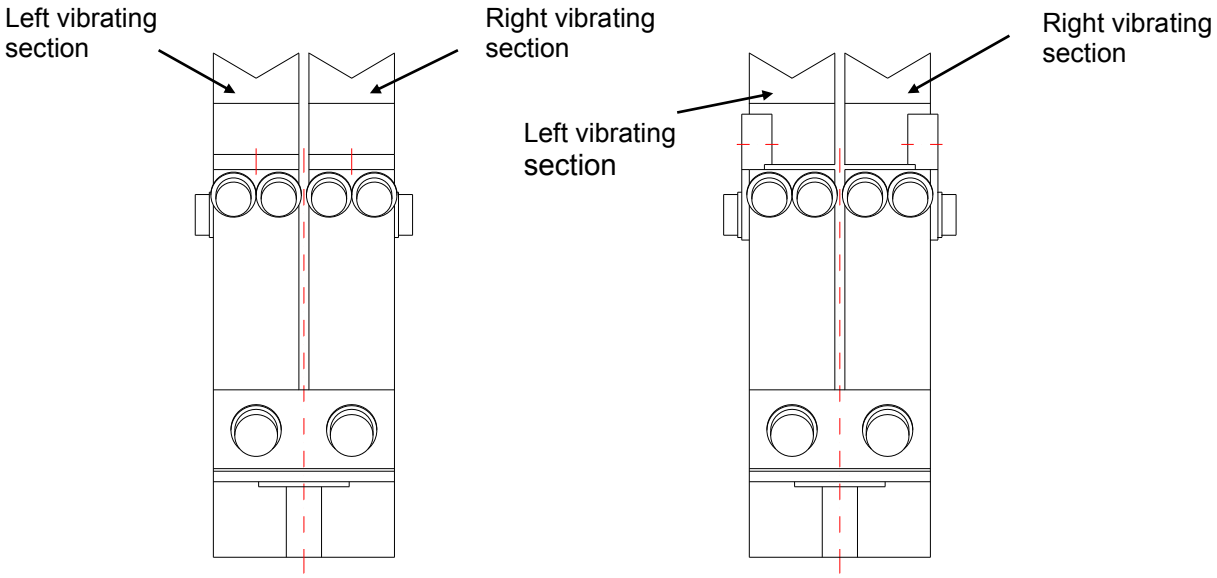
The vibrating sections are designed with recesses on the outer side to receive the angle brackets and trimming weights. The runout height of the linear track can be precisely adjusted during initial installation by means of the slot-type bores in the lateral plates. Thus no track readjustment is necessary when the linear track is removed and reinstalled for cleaning purposes or change to a different product.
Selection of the linear track location on the left or right is dependent on the installation and transfer requirements of the upstream and downstream equipment. The linear track must always be mounted at the inner side of the lateral plate (refer Fig. 5).
The weight of the linear track (refer chapter 3, table 1, or chapter 5.1, table 4) and its attachment (angle bracket and/or lateral plate) must be balanced by a counter mass (trimming weight) mounted to the second vibrating section. For a detailed description refer chapter 5.1, *Balancing the masses.*

Note: SLS 250 and SLS 800 require useful and counter masses to be identical at all times. SLS 400 and SLS 600 require a specific difference to be adhered to between useful and counter masses. Useful and counter masses should correspond to the values specified in chapter 5.1, table 4.

4.3.2 Attaching two linear tracks

Instead of the trimming weights (refer Figs 4 and 5) it is also possible to attach a second linear track (refer Fig. 6). Linear tracks may be attached using angle brackets as well as lateral plates. Balance the masses as described in chapter 5.1, Balancing the masses.

Figure 6: Linear feeder with two linear tracks

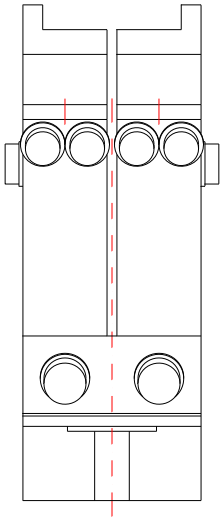


4.3.3 Attaching split linear tracks

For the purpose of feeding larger work pieces it is possible to provide a linear track design split in longitudinal direction, attaching each half to the associated vibrating section. Mass balancing is subject to the rules described in chapter 5.1, *Balancing the masses.* In this case, the mass balance impacts on the transport speeds of both linear track sections and should be adhered to as exactly as possible.
Larger work pieces are transported smoothly as long as these conditions are observed.
Recommended values for max. work piece widths refer table 3 .

Figure 7: Linear feeder with split linear track

Split linear track with angle attachment



Split linear track with lateral plate attachment

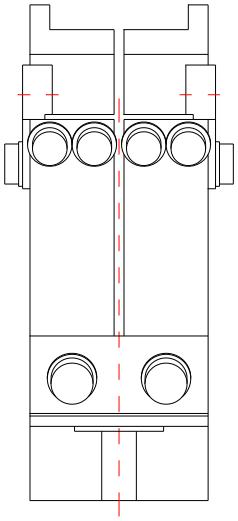


Table 3: Recommended values for maximum work piece widths

Type	Max. work piece width
SLS 250	Approx. 30 mm
SLS 400	Approx. 50 mm
SLS 600	Approx. 70 mm
SLS 800	Approx. 80 mm

5. Adjustment instructions

The first step in adjusting the linear feeders is always to balance the masses (chapter 5.1) and then to adjust the natural frequency (chapter 5.2).

5.1 Balancing the masses

As a consequence of the push-pull principle, RNA linear feeders virtually balance the vibration forces in the basic unit. However, this balance of vibration forces is ensured only if useful and counter masses are adjusted to each other as precisely as possible. For the linear feeders SLS 250 and SLS 800, this means that useful and counter masses must be identical. SLS 400 and SLS 600 require a specific mass difference to be adhered to between armature and magnet side. Table 4 below lists the armature side as the useful side so that there is a higher mass available for linear track design. Where the available space requires the linear track to be attached only to the magnet side of the serial unit, rearrange the magnet system so that the armature is on the magnet side and vice versa. In that particular case readjust the air gap afterwards as per chapter 5.3, Setting the air gap. Table 6 resumes validity after these steps have been performed.

The useful mass (i. e., the linear track mass, refer chapter 3, table 1, or chapter 5.1, chapter 4) is the total weight of all components attached to the linear track side, including lateral plate or angle bracket. Accordingly, the counter mass is the total of all individual weights of the components on the counter side including lateral plate or angle bracket.

Mass balance is checked through simple weighing of useful and counter masses. Any additional weights required to reach the masses specified in table 4 must be attached in such a way that the distance between the mass centre points of useful and counter masses, viewed in a direction transverse to the transport direction, is as close as possible. In other words, if possible, the additional masses should not protrude laterally beyond the linear feeder as this would lead to increased residual vibration in the floor.

The masses are precisely balanced when hardly any vibrations are noticeable in the floor and the transport speed of a component freely placed upon the linear track or counter mass, is identical on both vibrating sides.

Table 4: Recommended values for useful and counter masses with mass difference

Type	Useful mass [kg] (Armature side)	Counter mass [kg] (Magnet side)	Difference [kg]
SLS 250	0.30	0.30	0.00±0.02
SLS 400	0.65	0.55	0.10±0.02
SLS 600	1.80	1.30	0.50±0.03
SLS 800	3.00	3.00	0.00±0.05

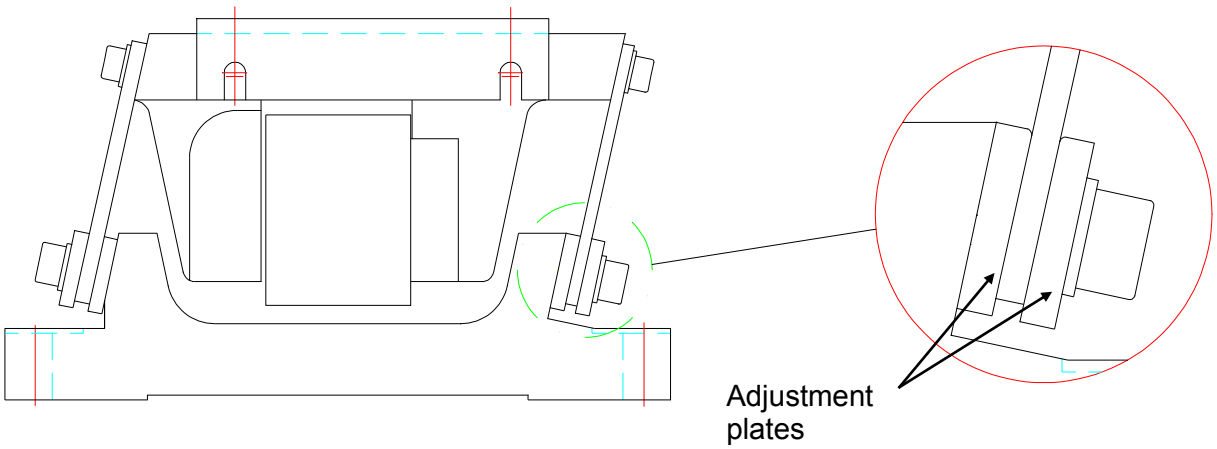
Note: 1. Useful and counter masses should correspond to the values specified in table 4.

Note: 1. Masses are fully balanced if hardly any vibrations are noticeable in the floor.
2. When masses are fully balanced, the transport speeds at useful and counter sides are identical.

5.2 Adjusting the natural frequency

The RNA linear feeder is a spring- mass vibration system that operates utilising the resonance behaviour.
Any changes in the mass require adjustment of the spring stiffness. For this purpose, sliding adjustment plates are provided on the spring assembly attachment at the base plate (refer Fig. 8). Sliding these adjustment plates sets the natural frequency.

Figure 8: Spring assembly with adjustment plates



ncy
o a

The adjustment procedure is as follows:

Place one test component on the linear track and switch on the controller. Use the rotary button to reduce the transport speed of the linear feeder until the component on the linear track moves only slowly. Keeping the controller setting constant, slowly loosen the screws of the adjustment plates at one linear feeder spring assembly (refer Fig. 8). Check the speed at which the test component is transported while the screws are being loosened. If the transport speed briefly increases initially and then decreases again as the screws are further loosened, the linear feeder is correctly adjusted and the natural frequency is slightly above the exciter frequency. The adjustment plates must be returned to the position they were in before the screws were loosened.
If the transport speed increases while the screws are loosened, and decreases only slightly or not at all when the screws are fully loosened, the linear feeder is adjusted too tightly and its natural frequency is too high. In this case, move the adjustment plates down or remove a leaf spring as required if the weight deviation is too great. Then repeat the test.
If the transport speed decreases immediately while the screws are being loosened, the linear feeder adjustment is too soft. In this case, move the adjustment plates up or install an additional leaf spring as required. Then repeat the test.
Make sure when sliding the adjustment plates that they are always horizontal and always arranged exactly opposite each other.

Adjustment plates up ⇒	Natural frequency increases
Adjustment plates down ⇒	Natural frequency decreases.

W A R N I N G : It is vital that the linear feeders be 'subcritically' adjusted (i.e. the natural frequency must be about 5% above the exciter frequency) as otherwise the magnet may overheat and burn out, and the transport speed may decrease as soon as components are placed upon the linear track.

To avoid the vibrating sections from subsiding, make sure to loosen the adjustment plates of one spring assembly only at a time during frequency setting.

Note: The adjustment plates must be aligned horizontally. The top edges must always be arranged opposite each other.

5.3 Setting the air gap

During serial assembly, the air gap of the magnet system is set to the values specified in table 5. If it deviates from the values specified in table 5, after adjusting natural frequency, for example, the air gap must be readjusted. For this purpose loosen the lateral armature fixing screws and reset the air gap with the help of a spacer (refer Fig. 9).

Figure 9: Armature attachment

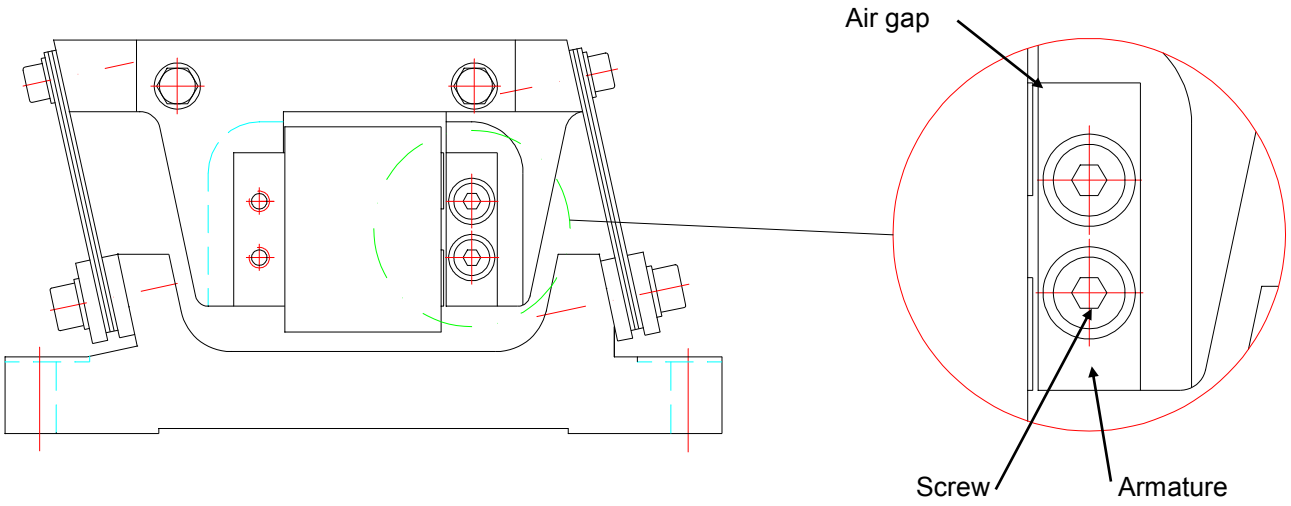


Table 5: *Setting values for the air gap between armature and magnet core*

Type	Power supply	Air gap value	Tolerance range
SLS250	230V/50Hz	0.8	± 0.05
	110V/60Hz	0.6	± 0.05
SLS400	230V/50Hz	0.8	± 0.05
	110V/60Hz	0.6	± 0.05
SLS600	230V/50Hz	1.0	± 0.05
	110V/60Hz	0.6	± 0.05
SLS800	230V/50Hz	0.8	± 0.05
	110V/60Hz	0.6	± 0.05

W A R N I N G : **Setting an air gap larger than specified may cause the magnet to overheat and the coil to burn out. It is therefore vital that the specified air gaps be adhered to.**

6. Maintenance

A type SLS linear feeder is basically maintenance-free. The leaf springs, however, may oxidise in certain conditions of use, thus affecting the vibration behaviour in the long run. In such cases the leaf springs may need to be removed and cleaned. Make sure to always dismantle one spring assembly only as the vibrating sections are otherwise displaced and trouble-free functioning is no longer guaranteed. Use the appropriate calibration gauge for initial linear feeder height adjustment (refer chapter 8, table 7: Accessories).

W A R N I N G : The leaf springs must not be oiled or greased as this would make the springs sticky and in turn adversely affect the vibration response.

7. Spare parts

Failure of individual components is not likely to occur during appropriate use as the SLS design does not include any wear-and-tear parts. Please order any individual components yet requiring exchange from RNA GmbH. The serial number of the unit is important for fast and correct handling of the spare parts delivery.

D

Rhein-Nadel Automation GmbH

Reichsweg 19/23 • D - 52068 Aachen
Tel (+49) 0241/5109-159 • Fax +(49) 0241/5109-219
Internet www.rna.de • Email vertrieb@rna.de

Rhein-Nadel Automation GmbH

Zweigbetrieb Lüdenscheid
Nottebohmstraße 57 • D - 58511 Lüdenscheid
Tel (+49) 02351/41744 • Fax (+49) 02351/45582
Email werk.luedenscheid@rna.de

Rhein-Nadel Automation GmbH

Zweigbetrieb Ergolding
Ahornstraße 122 • D - 84030 Ergolding
Tel (+49) 0871/72812 • Fax (+49) 0871/77131
Email werk.ergolding@rna.de

PSA Zuführtechnik GmbH

Dr. Jakob-Berlinger-Weg 1 • D – 74523 Schwäbisch Hall
Tel +49 (0)791/9460098-0 • Fax +49 (0)791/9460098-29
Email info@psa-zt.de

CH

HSH Handling Systems AG

Wangenstr. 96 • CH - 3360 Herzogenbuchsee
Tel +(41) 062/95610-00 • Fax (+41) 062/95610-10
Internet www.rna.de • Email info@handling-systems.ch

GB

RNA AUTOMATION LTD

Hayward Industrial Park
Tameside Drive, Castle Bromwich
GB - Birmingham, B 35 7 AG
Tel (+44) 0121/749-2566 • Fax (+44) 0121/749-6217
Internet www.rna-uk.com • Email rna@rna-uk.com

E

Vibrant S.A.

Pol. Ind. Famades C/Energia Parc 27
E - 08940 Cornella Llobregat (Barcelona)
Tel (+34) 093/377-7300 • Fax (+34) 093/377-6752
Internet www.vibrant-rna.com • Email info@vibrant-rna.com