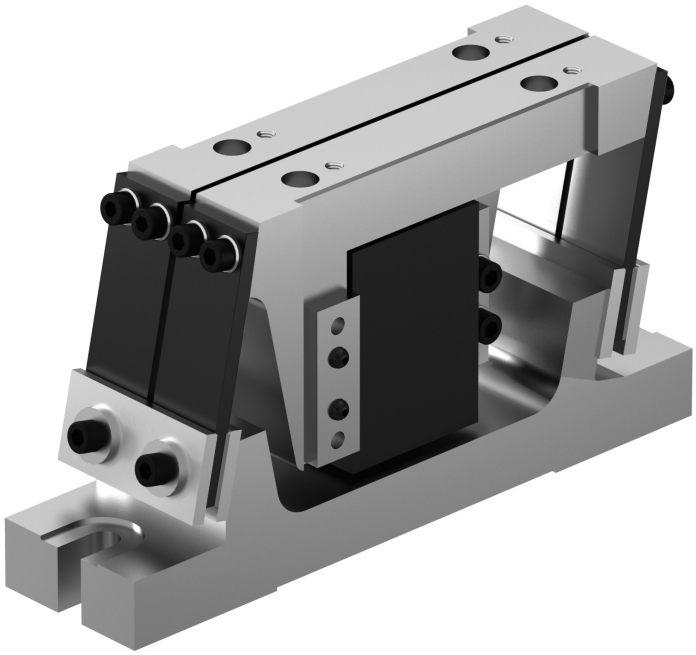
Operating & Installation Instructions

Linear Feeder
KLF5 / KLF7 / KLF15 / KLF25



Translation of the Original Assembly Instructions EN

- Linear feeder KLF5 (230 V/50 Hz) ⇨ Order no.: 15044649 (complete) 15152773 (basic unit)
- Linear feeder KLF5 (115 V/60 Hz) ⇨ Order no.: 15052019 (complete) 15087298 (basic unit)
- Linear feeder KLF7 (230 V/50 Hz) ⇨ Order no.: 15150973 (complete) 15059714 (basic unit)
- Linear feeder KLF7 (115 V/60 Hz) ⇨ Order no.: 15173186 (complete) 15125060 (basic unit)
- Linear feeder KLF15 (230 V/50 Hz) ⇨ Order no.: 15021614 (complete) 15132435 (basic unit)
- Linear feeder KLF15 (115 V/60 Hz) ⇨ Order no.: 15014508 (complete) 15165339 (basic unit)
- Linear feeder KLF25 (230 V/50 Hz) ⇨ Order no.: 15048476 (complete) 15185736 (basic unit)
- Linear feeder KLF25 (115 V/60 Hz) ⇨ Order no.: 15169958 (complete) 15006002 (basic unit)

Dear Customer

Thank you for choosing our products and placing your trust and confidence in our company!

These operating and installation instructions contain all essential information you need about your product. Our aim is to provide the required information as concisely and clearly as possible. If, however, you still have any questions on the contents or suggestions, please do not hesitate to contact us. We are always grateful for any feedback.

Our team will also be glad to answer any further question you may have regarding the linear feeder or other options.

We wish you every success with our products!

With kind regards

Your Afag team

© Subject to modifications

The linear feeders have been designed by Afag Automation AG according to the state of the art. Due to the constant technical development and improvement of our products, we reserve the right to make technical changes at any time.

Updates of our documentations



Unlike the printed documents, our digital instructions manuals, product data sheets and catalogues are being continuously updated on our website.

Please keep in mind that the digital documents on our website are always the latest versions.

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Afag Automation AG
Wernher-von-Braun Street 1
D-92224 Amberg (Germany)
Tel.: +49 (0) 9621 65 027-0
e-mail: sales@afag.com
Internet: www.afag.com

Afag Automation AG
Luzernstrasse 32
CH-6144 Zell (Switzerland)
Tel.: +41 62 959 86 86
e-mail: sales@afag.com
Internet: www.afag.com

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1 General

1.1 Contents and purpose of this manual

These operating and installation instructions contain important information on assembly, commissioning, functioning and maintenance of the linear feeder KLF to ensure safe and efficient handling and operation.

Consistent compliance with these operating instructions will ensure:

- permanent operational reliability of the linear feeders,
- optimal functioning of the linear feeders,
- timely detection and elimination of defects (thereby reducing maintenance and repair costs),
- prolongation of the linear feeder's service life.

The illustrations in this manual shall provide you with a basic understanding of the module and may vary from the actual design of your module.

1.2 Explanation of symbols

The safety notes are marked by a pictogram and a signal word. The safety notes describe the extent of the hazard.

DANGER



Danger!

This safety note indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING



Warning!

This safety note points out a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION



Caution!

This safety note points out a potentially dangerous situation which, if not avoided, can result in minor or slight injuries.

NOTICE

This safety note points out a potentially dangerous situation which, if not avoided, can cause substantial damage to property and the environment.

This note contains important additional information as well as useful tips for safe, efficient and trouble-free operation of the linear feeders.

Further warning signs:

Where applicable, the following standardised symbols are used in this manual to point out the various potential health risks.

	Warning - Dangerous electrical voltage.
	Warning - Risk of hand and finger injury due to uncontrolled movements of components.
	Warning - Magnetic field

1.3 Additional symbols

In these assembly instructions the following symbols are used to highlight instructions, results, references, etc..

Symbol	Description
1.	Instructions (steps ...)
⇨	Results of actions
➲	References to sections
■	Enumerations not ordered

1.4 Warranty

The warranty terms for Afag handling components and handling systems are the following:

- 24 months from initial operation and up to a maximum of 27 months from delivery.
- Wear parts are excluded from the warranty (The customer is entitled to a product free of defects. *This does also apply to defective accessories and wear parts. Normal wear and tear are excluded from the warranty.*

The warranty covers the replacement or repair of defective Afag parts. Further claims are excluded.

The warranty shall expire in the following cases:

- Improper use of the module
- Non-observance of the instructions regarding installation, commissioning, operation and maintenance.
- Improper assembly, commissioning, operation and maintenance
- Repairs and design changes carried out without prior technical instructions of Afag Automation AG
- Removing the serial number from the product
- Non-observance of the EC Machinery Directive, the Accident Prevention Regulations, the Standards of the German Electrotechnology Association (VDE) and these safety and assembly instructions.

1.5 Liability

No changes shall be made to the linear feeders unless described in this manual or approved in writing by Afag.

Afag accepts no liability for unauthorized changes or improper assembly, installation, commissioning, operation, maintenance or repair work.

2 Safety instructions

2.1 General

This chapter provides an overview of all important safety aspects to ensure safe and proper use of the linear feeders and optimal protection of personnel.

Safe handling and trouble-free operation of the controllers requires knowledge of the basic safety regulations.

Every person carrying out installation, commissioning, maintenance work or operating the linear feeders must have read and understood the complete user manual, especially the chapter on safety instructions.

Beyond this, there are rules and regulations regarding accident prevention that are applicable to the place of installation which must be observed.



Failure to follow the directions and safety instructions given in this instructions manual may result in serious hazards.

2.2 Intended use

The linear feeder KLF may only be used for transporting, buffering and arranging parts. With regard to the maximum permissible dimensions and weights of add-on parts, the notes in chapter 3 "Technical data" must be observed.

The following uses of the HLF are considered as improper **use** :

- Use in damp and wet areas
- Use at temperatures below 10°C or above 45°C
- Use in areas with highly flammable media
- Use in areas with explosive media
- Use in heavily polluted or dusty environments
- Use in aggressive environment (e.g. salty atmosphere)



The intended use of the module also includes:

- observance of all instructions given in this manual.
- compliance with the inspection and maintenance work and the specifications in the data sheets,
- using only original spare parts.

2.3 Foreseeable misuse

Any use other than or beyond the intended use described above is considered a misuse of the linear feeder.

WARNING



Risk of injury if the KLF is not used for its intended purpose or if it is foreseeable used incorrectly!

The improper use of the KLF poses a potential hazard to the personnel.

- The linear feeders may only be used in a technically perfect condition in accordance with its intended use and the instructions in this manual as well as in compliance with the safety requirements!

2.4 Obligations of the operator and the personnel

2.4.1 Follow these instructions

A basic prerequisite for safe and proper handling of the linear feeders is a good knowledge of the basic safety instructions.



This manual, in particular the safety instructions contained therein, must be observed by all persons working with the linear feeder.

2.4.2 Obligations of the operating company

In addition to the safety instructions given in this manual, the operating company must comply with the safety accident prevention and environmental protection regulations valid for the field of application of the linear feeder.

The operating company is required to use only personnel who :

- have the necessary professional qualifications and experience,
- are familiar with the basic rules regarding occupational safety and accident prevention,
- have been instructed in the correct handling of the linear feeder,
- have read and understood these operating instructions.

The operating company is also required to:

- monitor on an ongoing basis that the personnel work safely considering any potential hazard involved and the assembly instructions are observed,
- ensure that the assembly instructions are always kept at hand at the installation in which the linear feeder is mounted,
- observe and communicate universally applicable laws and regulations regarding accident prevention and environmental protection,
- provide the necessary personal protective equipment (e.g. protective gloves) and instruct the personnel to wear it.

2.4.3 Obligations of the personnel

All personnel working with the modules are required to:

- read and observe these assembly instructions, especially the chapter on safety,
- observe the occupational safety and accident prevention regulations,
- observe all safety and warning signs on the controllers,
- refrain from any activity that might compromise safety and health.



In addition, the personnel must wear the personal protective equipment required for carrying out their work. (➲chap. 2.6).

2.5 Personnel requirements

2.5.1 Personnel qualification

The activities described in the assembly instructions require specific requisites at the level of professional qualifications of the personnel.

Personnel not having the required qualification will not be able to asses the risks that may arise from the use of the linear feeder thus exposing himself and others to the risk of serious injury. Therefore, only qualified personnel may be permitted to carry out the described activities on the linear feeders.

These operating instructions are intended for skilled personnel (installers, system integrators, maintenance personnel, technicians), electricians and operating personnel.

The following is a description of the professional skills (qualifications) required for carrying out the different activities:

Qualified personnel:
Qualified personnel with appropriate training who are qualified due to their special know-how and fully familiar with the machine and who have been given instructions on how to carry out the task entrusted to them safely.

Qualified electrician:
Persons who have obtained their electrical qualifications through appropriate professional training and complementary courses that enables them to identify risks and prevent possible hazards resulting from electricity.

Operator (trained personnel):
Authorized persons who due to their specialized professional training, expertise and experience can identify risks and preventing possible hazards arising from the use of the machine.

2.6 Personal protective equipment (PPE)

The personal protective equipment serves to protect the personnel from hazards affecting their safety and health at work.

When working on/with the linear feeder, the personnel must wear the personal protective equipment assigned by the safety officer of the operating company or as required by safety regulations. In addition, the personnel are required to:

- wear the personal protective equipment provided by the operating company (employer),
- check the personal protective equipment for proper condition, and
- immediately notify the person responsible on site of any defects found on the personal protective equipment.

2.7 Changes & Modifications

No changes may be made to the linear feeders which have not been described in these operating instructions or approved in writing Afag Automation AG.

Excluded from this are the rails stated in ➲ chap. 6.4.1 and ➲ chap. 6.2.3, as well as the accessories specified in ➲ chap. 3.3.

Afag Automation AG accepts no liability for unauthorised changes or improper assembly, installation, commissioning, maintenance or repair work.



The linear feeders may not be changed or modified in any way, except with the prior written consent of Afag.

2.8 General hazards / residual risks

Despite the safe design of the KLF and the technical protective measures taken, there still remain residual risks that cannot be avoided, and which present a non-obvious residual risk when operating the rotary modules.

Observe the safety instructions in this chapter and in the other sections of this manual to avoid damage to property and dangerous situations for the personnel.

2.8.1 General hazards at the workplace

The KLF linear feeder has been built according to the state-of-the-art and the applicable health and safety requirements. However, improper use of the linear feeder may cause the following hazards to the personnel:

- danger to life and limb of the operator or third parties,
- on the KLF themselves,
- property damage.

Always keep the operating instructions ready at hand at the workplace! Please, also observe:

- the general and local regulations on accident prevention and environmental protection,
- the safety information sheet for the linear feeder.

WARNING



Danger - Do not use in unsuitable environment !

The KLF are designed for use in **non-**explosive atmospheres.

- Do **not** use the KLF modules in potentially explosive atmospheres!

CAUTION



Risk of injuries due to uncontrolled parts movements!

When operating the KLF uncontrolled movements may occur which can cause personal injury or property damage.

- Only qualified personnel may work with or on the KLF.
- Read this manual carefully before carrying out any work on or with the KLF.

2.8.2 Danger due to electricity

WARNING



Danger! Risk of electric shock!

If work on electrical components is required, ensure that the work is carried out properly, failure to do so will cause serious or fatal injuries.

- Work on the machine's electrical equipment may only be performed by skilled electrician or trained personnel under the supervision of a skilled electrician in accordance with all relevant electrical regulations.

2.8.3 Hazards due to strong alternating magnetic fields

DANGER



Danger due to alternating magnetic fields!

The alternating magnetic fields occurring in the immediate vicinity of the KLF can affect the proper functioning of e.g., pacemakers and defibrillators.

Persons with a pacemaker must keep a **safety distance** of **at least 10 cm**.

2.8.4 Mechanical hazards



CAUTION

Danger of injury by moving components!

Limbs can be crushed by moving components!

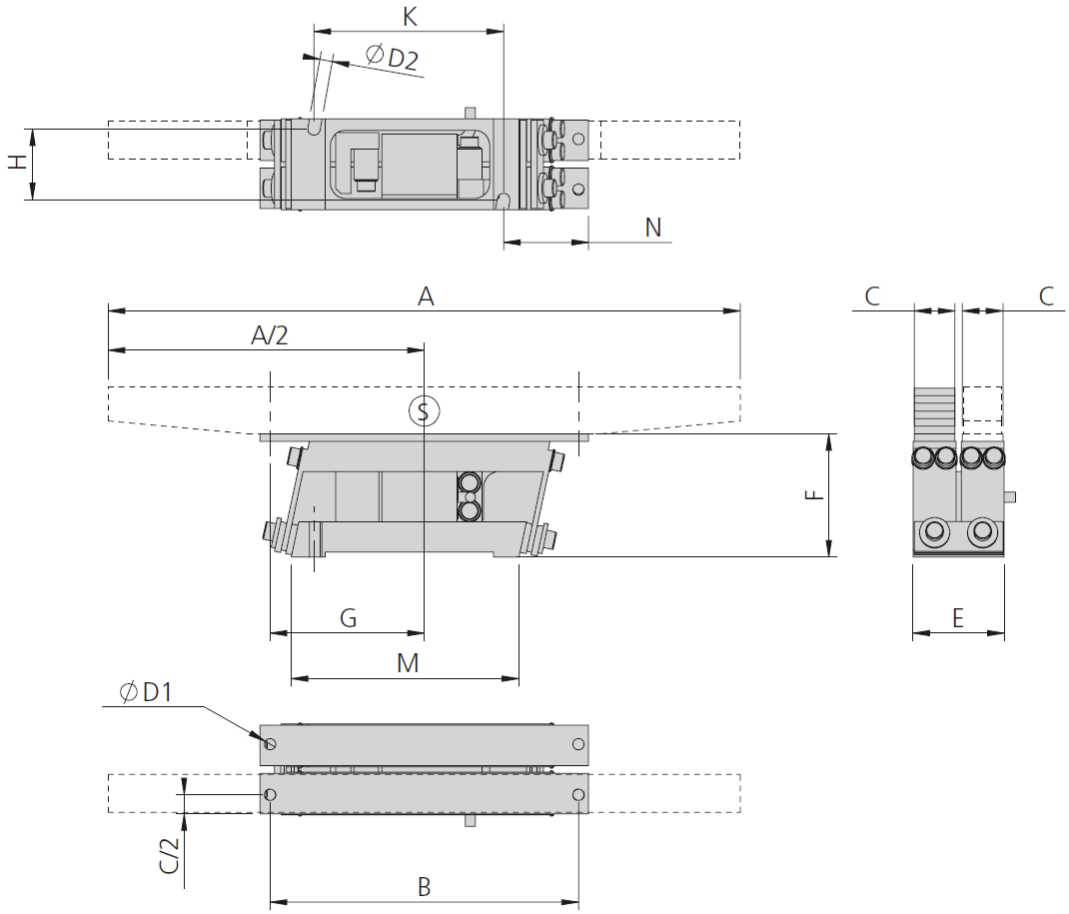
- Work on and with the KLF may only be carried out by qualified personnel.
- Never reach into the system during normal operation!

3 Technical data

3.1 Dimensional drawing KLF

3.1.1 Dimensional drawing KLF5

Type	KLF5
A	150-250 mm
B	122 mm
C	16 mm
D1	4.5 mm
D2	5 mm
E	36 mm
F	49 mm
G	61 mm
H	28 mm
K	75 mm
M	90 mm
N	34 mm

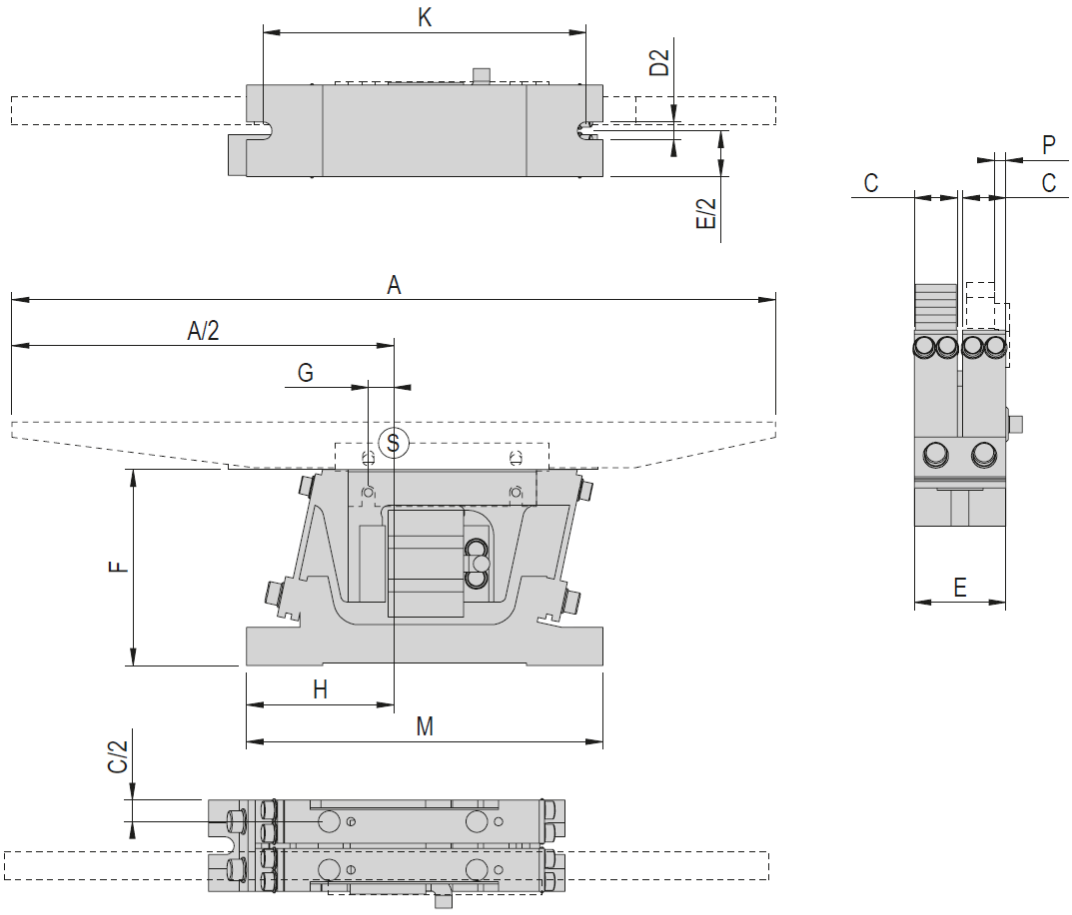


R = Feeding direction
S = Track center of gravity

Fig. 1 Dimensional drawing - KLF5

3.1.2 Dimensional drawing KLF7-KLF25

Type	KLF7	KLF15	KLF25
A	200-400 mm	300-600 mm	500-800 mm
C	17 mm	24 mm	29 mm
D2	7 mm	9 mm	10 mm
E	36 mm	50 mm	60 mm
F	77 mm	108 mm	135 mm
G	10 mm	30 mm	45 mm
H	57.9 mm	99.4 mm	142 mm
K	127 mm	177 mm	280 mm
M	140 mm	200 mm	300 mm
P	4.5 mm	4.5 mm	3 mm



R = Feeding direction
S = Track center of gravity

Fig. 2 Dimensioned drawing KLF7-KLF25

3.2 Technical data KLF

3.2.1 Technical data KLF5

KLF5	
Operating temperature	10 - 45 ° C

Type	KLF5	KLF5
Order number	**15044649**	**15052019**
Mechanical vibration frequency	100 Hz	120 Hz
Mains connection (mains voltage/mains frequency)	230 V/50 Hz	115 V/60 Hz
Max. power consumption	10 VA	10 VA
Net weight	1.2 kg	1.2 kg
Max. weight feed rail (ancor side)	0.3 kg	0.3 kg
Weight difference (feed rail - trim weight)	0 kg	0 kg
Max. feeder speed	7 m/min	7 m/min
Reactive force compensation	•	•
Protection type	IP54	IP54

Note: • = existent
Track not included in scope of supply.

Inlcuded in delivery
- 2x Leaf spring KLF
- 5x Trim weight (KLF5)

3.2.2 Technical data KLF7-KLF25

KLF7 - KLF25	
Operating temperature	10 - 45 ° C

Type	KLF7	KLF7	KLF15	KLF15	KLF25	KLF25
Order number	**15150973**	**15173186**	**15021614**	**15014508**	**15048476**	**15169958**
Mechanical vibration frequency	100 Hz	120 Hz	100 Hz	120 Hz	100 Hz	120 Hz
Mains connection (mains voltage/mains frequency)	230 V/50 Hz	115 V/60 Hz	230 V/50 Hz	115 V/60 Hz	230 V/50 Hz	115 V/60 Hz
Max. power consumption	15 VA	15 VA	25 VA	25 VA	60 VA	60 VA
Net weight	1.9 kg	1.9 kg	4.6 kg	4.6 kg	12.7 kg	12.7 kg
Max. weight feed rail (ancor side)	0.65 kg	0.65 kg	1.8 kg	1.8 kg	3.0 kg	3.0 kg
Weight difference (feed rail - trim weight)	0.1 kg	0.1 kg	0.5 kg	0.5 kg	0 kg	0 kg
Max. feeder speed	7 m/min	7 m/min	7 m/min	7 m/min	7 m/min	7 m/min
Reactive force compensation	•	•	•	•	•	•
Protection type	IP54	IP54	IP54	IP54	IP54	IP54

Note: • = existent
Track not included in scope of supply.

Inlcuded in delivery

- 2x Bracket KLF
- 2x Leaf spring KLF
- 5x Trim weight (KLF7)
- 6x Trim weight (KLF15)
- 1x Trim weight (KLF25 (400 g))
- 3x Trim weight (KLF25 (800 g))

3.3 Accessories

3.3.1 Mounting parts

Type	Designation	Weight [g]	Order Number
KLF5	Trimming weight NM07	25 [g]	15183426
KLF7	Trimming weight	100 [g] 50 [g]	15148404 15209275
	Angle	47 [g]	15032942
	Side plate	70 [g]	15157317
KLF15	Trimming weight	200 [g] 100 [g]	15081054 15192548
	Angle	133 [g]	15026423
	Side plate	190 [g]	15107163
KLF25	Trimming weight	400 [g] 800 [g]	
	Angle	350 [g]	152088257
	Side plate	550 [g]	15010882

Tab. 1 Attachment parts and ordering data

3.3.2 Controller

Type	Power supply	Order Number	Note
IRG1-S	230V/50Hz	50360105	Control without timer function External setpoint setting
	115V/60Hz	50360106	
MSG801	230V/50Hz - 115V/60Hz	50391818	Sensor feed, timer function, valve and interface outputs
MSG802	230V/50Hz - 115V/60Hz	50391819	Sensor feed

Tab. 2 control units for KLF



For more information on the controller, see ➲ chap. 6.3 and the controller manufacturer's instructions.

4 Transport, packaging and storage

4.1 Safety instructions

CAUTION



Danger of injury due to improper transport equipment!

The improper use of transport equipment such as industrial trucks, overhead cranes, slings can lead to injuries (e.g., crushing)!

- Observe transport and assembly instructions.
- Use the means of transport properly!

NOTICE

Damage to property due to improper lifting!

The linear feeder must not be lifted at the conveyor rail! Using the conveyor rail as a lifting point can damage the linear feeder!

- Lift the linear feeder by the base only!



The linear feeders are packed in the original packaging (cardboard box). Carefully remove the linear feeder from the original packaging.

4.2 Scope of supply

The corresponding documentation is supplied with each linear feeder (e.g., operating and installation instructions, etc.).

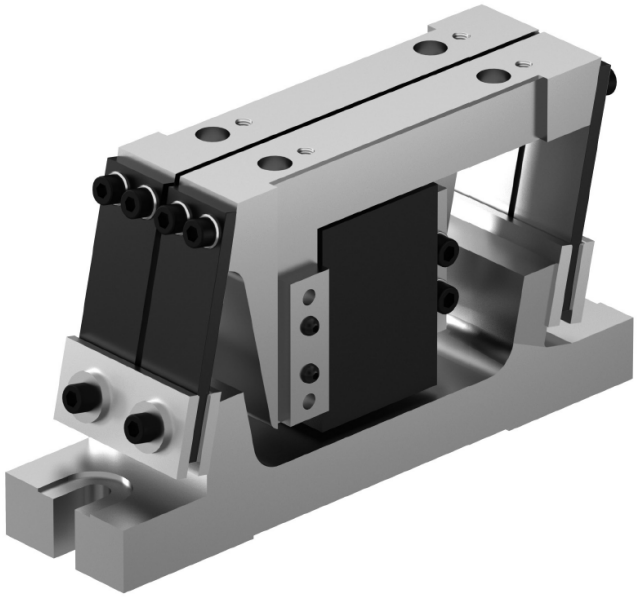


Fig. 3 Scope of delivery KLF

[Unt]	Designation
1 x	Linear feeder KLF
1 x	Operating and installation instructions

4.3 Transport

No liability can be assumed for damages caused by improper installation on the part of the operating company.

The following conditions must be complied with for transport and storage:

- Storage temperature: 0-50 °C
- Relative air humidity: < 90%, non condensing

4.4 Packaging

The linear feeder is transported in the Afag Automation AG transport packaging. If no Afag packaging is used, the linear feeder must be packed in such a way that it is protected against shocks and dust.

NOTICE

Risk to the environment due to incorrect disposal of the packaging material!

Environmental damage can be caused by incorrect disposal of the packaging material.

- Dispose of the packaging material in an environmentally sensitive way in accordance with the local environmental regulations.

4.5 Storage

If the linear feeder is stored for an extended period, observe the following:

- Store the linear feeder in the transport packaging.
- Do not store the telescope spindle axes outdoors or expose them to weather conditions.
- The storage space must be dry and dust free.
- Room temperature of the storage space: 0-50 °C.
- Relative air humidity: < 90% non condensing.
- Protect the linear feeder from dirt and dust.

5 Design and description

5.1 Structure of the KLF

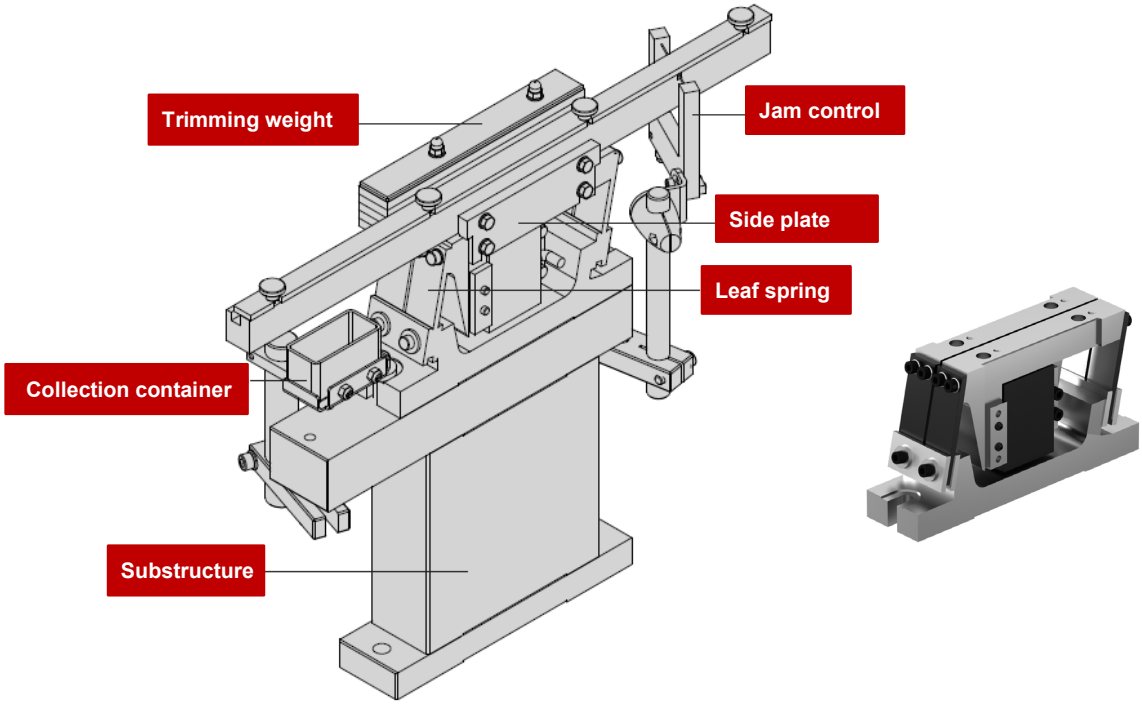


Fig. 4 Design of the KLF feeder

5.2 Description of the KLF

The Afag linear feeders of the KLF type are used to remove parts from upstream machines and/or feed parts to downstream machines.

Furthermore, Afag linear feeders are also used for sorting parts, with due consideration of various criteria. Linear feeders are fitted in individual feeding units as well as in complex assembly systems.

The KLF consist of two oscillating parts arranged on top of each other which oscillate asynchronously. Slotted leaf springs connect these to a common base plate at which the opposing oscillating forces virtually cancel each other out.

Each of the oscillating parts can work as a working weight or counterweight. Furthermore, it is possible to operate both oscillating parts as working weight. A magnet system (anchor-magnet core) is installed horizontally between two vibrating parts. Due to the adjustable balance of weights between the working weight and counterweight, the free oscillating forces can be largely eliminated directly in the unit.

The KLF linear feeders are to be operated in combination with an Afag controller. Only in this combination can optimum conveying behaviour be guaranteed.

6 Installation, assembly and setting

For safe operation, the module must be integrated into the safety concept of the system in which it is installed.

During normal operation, it must be ensured that the user cannot interfere with the working area of the linear feeder. This can be achieved through suitable protective measures (e.g. enclosure, light grid).

When the system is running in special operating modes, it must be ensured that there is no danger to the operator.

The system operator is responsible for the installation of the linear feeder in a system!

6.1 Safety instructions

WARNING

Danger! Risk of electric shock!



If work on electrical components is required, ensure that the work is carried out properly, failure to do so will cause serious or fatal injuries.

- Work on the machine's electrical equipment may only be performed by skilled electrician or trained personnel under the supervision of a skilled electrician in accordance with all relevant electrical regulations.
- Disconnect the power supply before assembly and disassembly work and when making changes to the installation!

No warranty will be granted for damage caused by improper installation on the part of the operating company.

Observe the safety instructions in ➲ chap. 2 "Safety instructions" of this manual as well instructions in ➲ chap. 6.3.

6.2 Assembly

6.2.1 Tightening torques

Tightening torques M_{Sp} in [Nm] for shaft bolts with metric ISO standard threads and head rests according to DIN 912 or DIN 931.

Screw	Tightening torques M_{Sp} in [Nm]		
	Strength class 8.8	Strength class 10.9	Strength class 12.9
M4	2.8	4.1	4.8
M5	5.5	8.1	9.5
M6	9.5	14.0	16.5
(M7)	15.5	23.0	27.0
M8	23.0	34.0	40.0
M10	46.0	68.0	79.0
M12	79.0	117.0	135.0
M14	125.0	185.0	215.0
M16	195.0	280.0	330.0
M18	280.0	390.0	460.0
M20	390.0	560.0	650.0
M22	530.0	750.0	880.0
M24	670.0	960.0	1120.0
M27	1000.0	1400.0	1650.0
M30	1350.0	1900.0	2250.0

6.2.2 Fastening the module

The KLF is firmly bolted to the foundation using the slots (2) made in the base plate. This means that the interfaces at the infeed and outfeed of the conveyor rails are precisely defined and adjustable.

In the horizontal plane, the base should be designed to be vibration-resistant (slab or block construction) to be able to absorb possible residual forces. Self-supporting profile constructions must be reinforced with a base plate to which the linear feeder is attached. Here, a plate made of steel should be used that is at least 20mm thick and has a width of more than 120mm.

The vertical oscillating forces responsible for energy induction in the foundation structure should be virtually eliminated by a careful balance of weights (➲ chap. 6.4.2). The height adjustment must be made by means of appropriate substructures. Suitable Afag standard components are available for complete station set-ups.

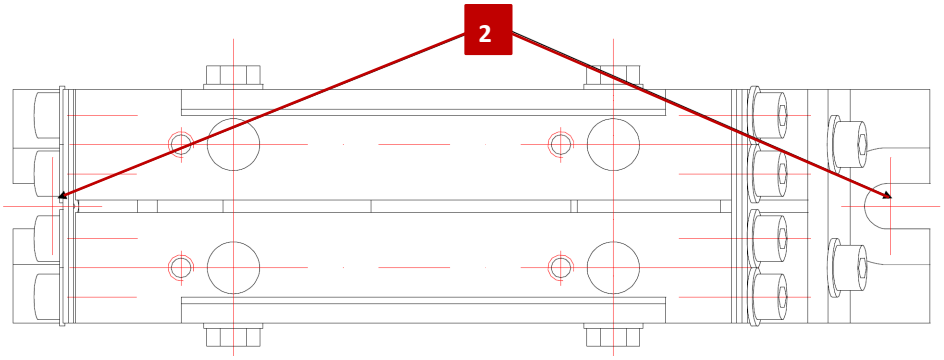


Fig. 5 Attachment slots(2) for the KLF

6.2.3 Assembly of the conveyor rail

The conveyor rail is attached to the left or right swing section by means of a mounting bracket or side plate.

With the KLF5, the conveyor trough is attached directly to the oscillating section. In all cases, ensure the correct fastening position according to chapter 3 .

Deviations can have a negative effect on foundation excitation.

Fastening with angle:

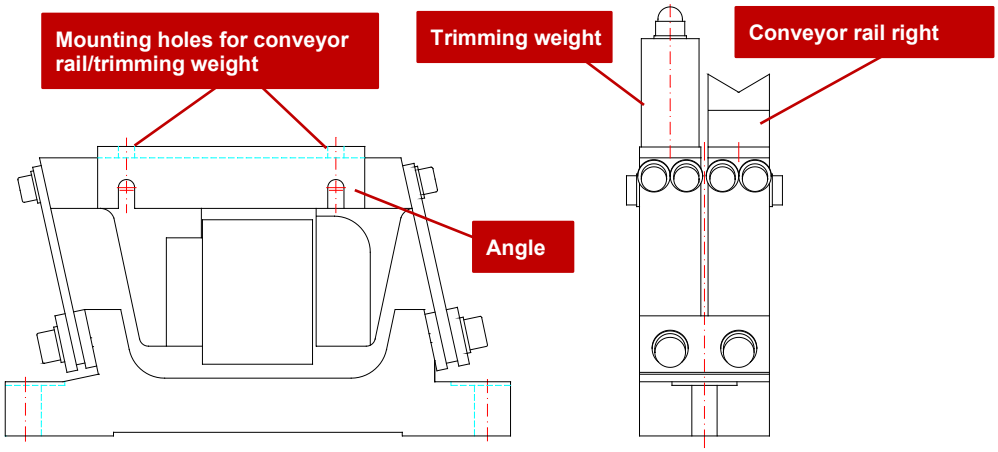


Fig. 6 Fastening the KLF with an angle bracket

Fastening with side plate:

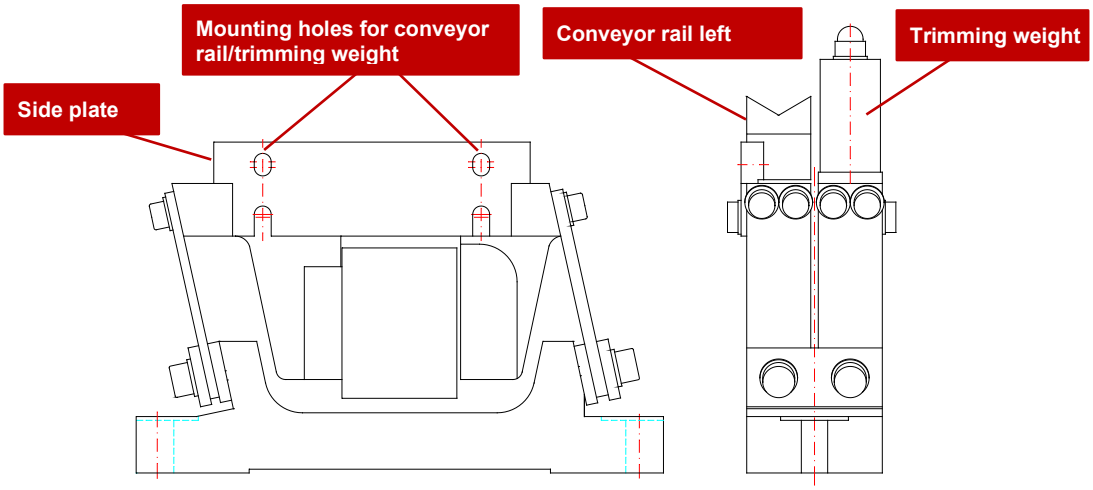


Fig. 7 Fastening the KLF with a side plate

The swing parts are provided with recesses on the outer sides for holding the brackets or trimming weights.

By means of the fixing holes (slotted holes) on the side plates, the discharge height of the conveyor rail can be precisely adjusted during initial assembly.

When the conveyor rail is installed or removed again for cleaning or conversion to another product, it is then no longer necessary to adjust the rail.

The choice of the position of the conveyor rail (left or right) depends on the installation and transfer conditions of the upstream and downstream units.

The conveyor rail must always be mounted on the inside of the side plate. The weight of the conveyor rail (➲chap. 6.4.2,tab. 4) and its attachment (bracket or side plate), must be compensated by a counterweight (trimming weight) attached to the second swing part.

Working weight and counterweight must always be the same for the KLF5/KLF25.

- For the KLF7 and KLF15, a certain difference between working weight and counterweight must be maintained.
- Working weight and counterweight should correspond to the values given in ➲ chap. 6.4.2.

6.2.4 Assembly of two conveyor rails

A second conveyor rail can also be fitted instead of the trimming weights. The installation of the conveyor rails can be done with angles as well as with side plates. The balance of weights is to be carried out according to ➲ chap. 6.4.2.

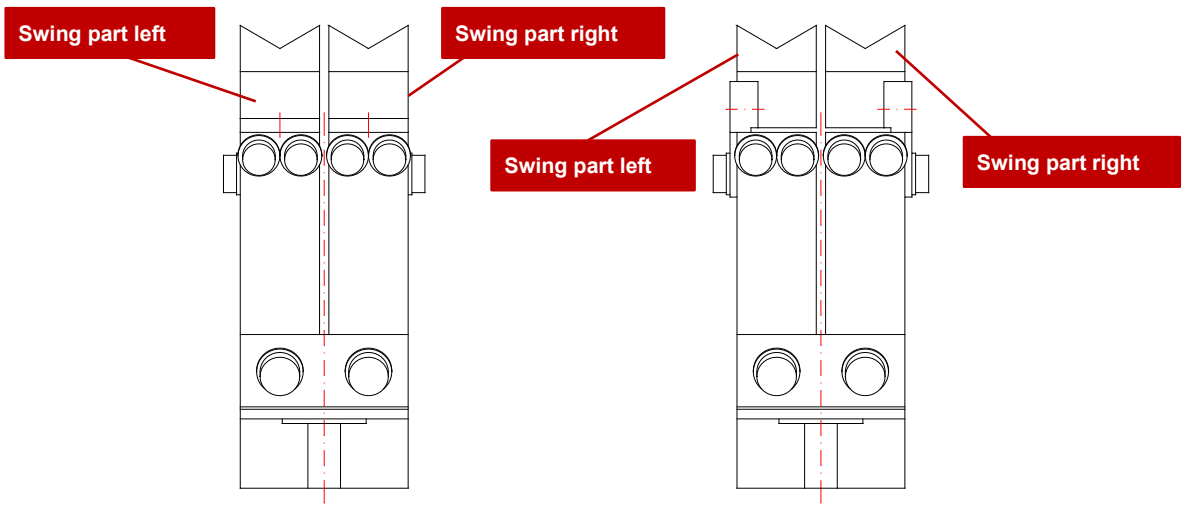


Fig. 8 Linear feeder with two conveyor rails

6.2.5 Assembly of divided conveyor rails

For feeding larger workpieces, there is the constellation of providing a divided conveyor rail in the longitudinal direction and fastening it to the respective swing part.

For balance of weights, the principles according to ➲ chap. 6.4.2 apply. In this case, the balance of weights affects the conveying speeds of both individual parts of the conveyor rail and should be carried out as precisely as possible.

Taking these conditions into account, even larger workpieces can be transported precisely (for max. workpiece widths, see the following table).

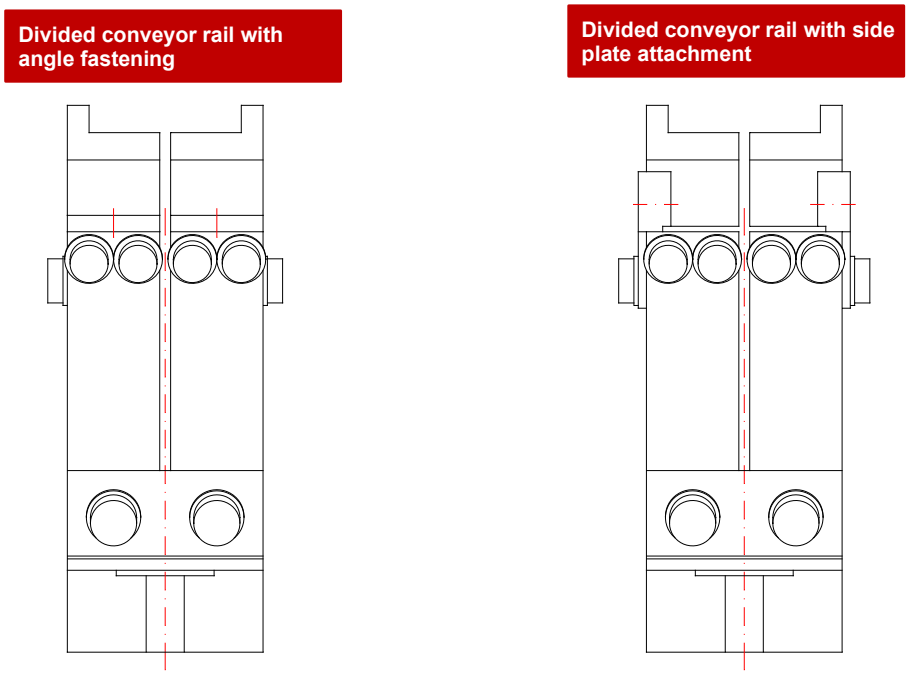


Fig. 9 Linear feeder with divided conveyor rail

Maximum workpiece widths

Type	Max. workpiece width [mm]
KLF5	approx. 30
KLF7	approx. 50
KLF15	approx. 70
KLF25	approx. 80

6.3 Electrical connection

WARNING

Danger! Risk of electric shock!

Improperly performed work can result in serious or fatal injuries.

- Work on the machine's electrical equipment may only be performed by skilled electrician or trained personnel under the supervision of a skilled electrician in accordance with all relevant electrical regulations.

Important notes on the electrical connection:

- The mains supply must be provided by the customer via a residual current circuit breaker!
- The feeder may only be operated with the mains supply specified on the type plate!
- The electrical connections must be covered!
- Protective conductor connections must be checked for proper function after installation.
- Emergency-STOP devices must remain effective in all operating modes. Unlocking the Emergency-STOP devices must not cause an uncontrolled restart!

Power connection via controller

The feeder KLF is connected to the AC mains 230V/50Hz via a controller type IRG or MSG. The design for other mains voltages and frequencies is possible (e.g. 115V/60Hz).

The IRG1-S controller is available for controlling the linear conveyors. The MSG801 or MSG802 can also be used.

An additional CEE appliance plug is required for the MSG controls (order no.: 11006982!).

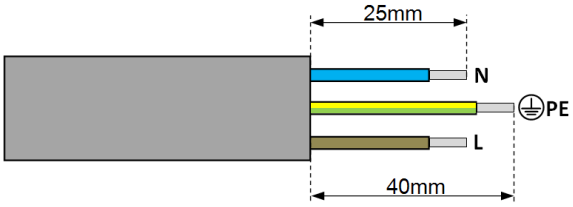


Fig. 10 Cable end additional plug

The linear feeder operates in full-wave mode at twice the mains frequency, i.e. at 50Hz AC with a mechanical vibration frequency of 100Hz.

Vibration displacement and thus the transport speeds are infinitely adjustable due to magnet current and thus magnetic force variability. All IRG types operate with soft-starting and offer different options for mounting, attachment and control.

A detailed description of the controller can be found in the AFAG general catalogue. Third-party control units can also be used, provided they meet the technical conditions.

6.4 Settings

When adjusting the linear feeder, always adjust the balance of weights first and then the natural frequency.

6.4.1 Design of the conveyor rails

The conveyor rails must be designed to be vibration-resistant so that the conveying impulses generated by the unit are transferred exactly to the conveyor rail and thus to the parts and no superimposed natural vibrations of the conveyor rail negatively influence the conveying process.

This requirement has priority over measures to reduce mass.

Tool steel is the preferred material for conveyor rails (e.g.: 1.2842, 90MnCrv8) should be preferred.



When designing the conveyor rail, observe the technical data (➲ chap. 3.2) as well as the ➲*dimensions of the conveyor rails* given in this chapter and the *values for the working weight and counterweight* given in ➲chap. 6.4.2.

Conveyor rail dimensions

The following applies to the dimensional ratio of the conveyor rail cross-section:

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

[mm]	KLF5	KLF7	KLF15	KLF25
Length	250	400	600	800
Width	16	17	24	29

Tab. 3 Table with the recommended dimensions of the conveyor rails



The dimensions are for one vibrating section and can be applied to each of the two vibrating sections.

6.4.2 Adjust balance of weights

The oscillating forces in the base plate of the linear feeder are compensated almost completely due to the principle of opposing oscillations.

However, this compensation of oscillating forces is only guaranteed if the working weight and counterweight are matched as closely as possible.

The balance of weight is then precisely adjusted when:

- Almost no vibrations are felt in the base element any more.
- The conveying speed of a material that is placed freely on the conveyor rail or counterweight is the same on both vibrating sides.



Tuning balance of weight for KLF5 and KLF25

- Working weight and counterweight must be equal.

Tuning balance of weight for KLF7 and KLF15

- A certain mass difference must be maintained between the anchor and magnet sides.



The working weight (conveyor rail mass) results from the total weight of all parts attached to the conveyor rail side including side plate or angle.

The counterweight thus results from the sum of the individual parts attached to the opposite side including the side plate or angle.

Control of balance of weight

The balance of weight is verified by simply weighing the working weight and counterweight.

Conversion of the magnet system

If the conveyor rail can only be mounted on the magnet side of the standard unit for space reasons, the magnet system must be converted so that the anchor is on the magnet side.



If the magnet system is converted, the air gap must then be readjusted according to chap. 6.4.4 .

Values for the working weight and counterweight

Type	Working weight [kg] (anchor side)	Counterweight [kg] (magnet side)	Difference [kg]
KLF5	0.30	0.30	0.00±0.02
KLF7	0.65	0.55	0.10±0.02
KLF15	1.80	1.30	0.50±0.03
KLF25	3.00	3.00	0.00±0.05

Tab. 4 Values for the working weight and counterweight

The anchor side is listed as the working side (see Tab. 4) so that a higher mass is available in the conveyor rail design.

Additional weights

If additional weights are required to achieve the specified masses, these must be provided in such a way that the distance between the centres of mass of the working weight and counterweight, viewed transversely to the direction of conveyance, are positioned as close as possible.

If possible, the additional masses should not protrude laterally over the linear feeder, as this would otherwise lead to increased residual vibrations in the base construction.

6.4.3 Natural frequency fine adjustment

The Afag linear feeder works by making use of resonance. Mass changes require a change in spring stiffness.

For this purpose, sliding adjustment plates (1) are mounted on the base plate attachment of the spring assemblies. The natural frequency is adjusted by moving these adjustment plates.

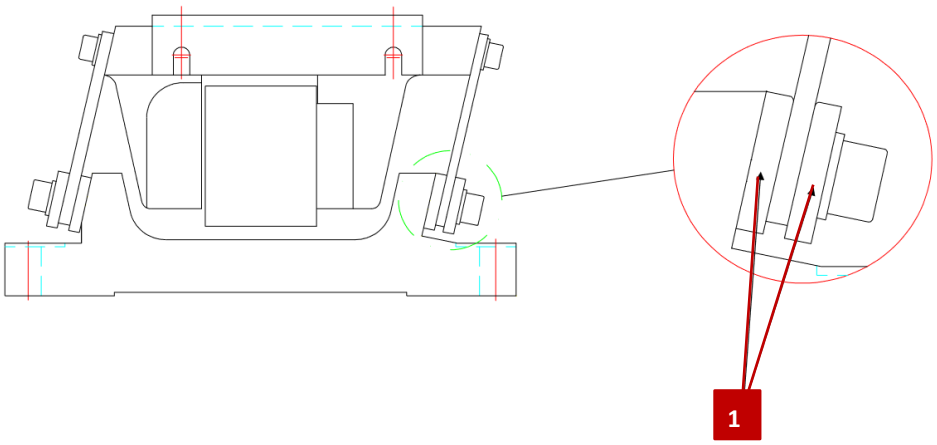


Fig. 11 Spring assembly with adjustment plates (1)

The linear feeder must always be "sub-critically" adjusted, i.e. the exciting frequency must be approx. 5% above the natural frequency.

- Feeder with 100Hz: This results in a natural frequency of approx. 104Hz.
- Feeder with 120Hz: This results in a natural frequency of approx. 126Hz.

When moving the setting plates, make sure that the setting plates are always horizontal and that the top edges are always exactly opposite each other.

- Adjustment plates upwards → Inherent frequency increases
- Adjustment plates downwards → Natural frequency decreases
- Loosen the adjustment plates only at one spring assembly at a time to prevent the oscillating parts from sinking.

To fine adjustment of the natural frequency, carry following test:

1. Place the test part on the conveyor rail and switch on the controller.
2. Reduce the conveying speed of the KLF until the test part only moves slowly on the conveyor rail.
3. Keep the setting of the controller constant and slowly loosen the screws of the setting plates on a spring assembly of the feeder.
4. Check the transport speed of the test part while loosening the screws:
   - If the conveying speed increases briefly and then decreases again when the screws are loosened further, the linear feeder is set correctly.
   - The natural frequency is slightly higher than the excitation frequency.
   - Return the adjustment plates to the position they had before loosening the screws.

   ⇨ The process is completed.

In the following cases, the natural frequency of the linear feeder is not set correctly and must be readjusted by moving the adjustment plates.

- The conveying speed increases when the screws are loosened and does not decrease, or only slightly, when the screws are completely loosened.
  - The linear feeder is still too stiffly adjusted. The natural frequency is still too high.
  - Push the adjustment plates down or - if the weight deviation is too great - remove a leaf spring.
  - Carry out the test for fine adjustment of the natural frequency (see above) again.

  ⇨ The process is completed.

- If the conveying speed decreases immediately when the screws are loosened, the linear feeder is still set too soft.
  - Push the adjustment plates upwards or, if necessary, install an additional leaf spring.
  - Carry out the test for fine adjustment of the natural frequency (see above) again.

  ⇨ The process is completed.

6.4.4 Adjust air gap

The air gap of the magnet system is set to the values given in the following table during series assembly.

Type	Power supply	Air gap value [mm]	Tolerance
KLF5	230V/50Hz	0.8	± 0,05
	115V/60Hz	0.6	± 0,05
KLF7	230V/50Hz	0.8	± 0,05
	115V/60Hz	0.6	± 0,05
KLF15	230V/50Hz	1.0	± 0,05
	115V/60Hz	0.6	± 0,05
KLF25	230V/50Hz	0.8	± 0,05
	115V/60Hz	0.6	± 0,05

Tab. 5 Values for the air gap of the magnet system

If the air gap deviates from the specified values (e.g. after a natural frequency adjustment), the air gap must be readjusted.

NOTICE

Danger of property damage due to overheating!

If a larger air gap than specified is set, there is a risk that the magnet will overheat and burn out the coil.

- Always comply with the specified air gap values!

To set the air gap proceed as follows:

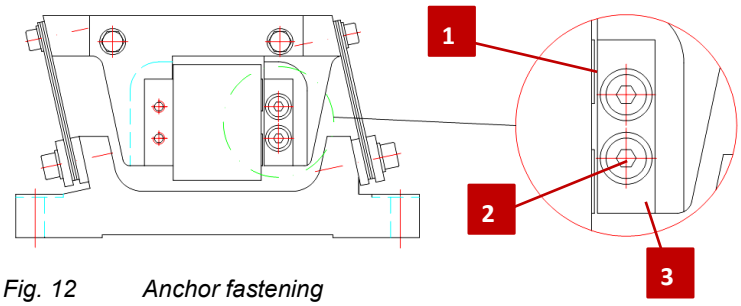


Fig. 12 Anchor fastening

1. Remove the cover.
2. Loosen the lateral fastening screws (2) of the magnetic anchor (3).
3. Readjust the air gap (1) using the distance gauge.
   - The surfaces of the magnetic core and the magnetic anchor (3) must be exactly parallel to each other.
4. Tighten the fastening screws (2).

   ⇨ The process is completed.

7 Operation

After connection, the linear feeders are put into operation for the first time via the system controller.

Commissioning must only be carried out in setup/jog mode. Before commissioning, check whether the rated voltage of the device matches the local mains voltage.

7.1 Safety instructions for commissioning

DANGER



Risk of injury due to electric shock!

Unauthorized removal of the plug cover causes a risk of electric shock!

- Do NOT dismount the plug cover!
- Avoid any action on the module which could endanger safety!

7.2 Preparatory activities for commissioning

The linear feeder is designed for operation with AFAG - controllers. The modules can also be operated with other control systems.

The operation of the AFAG servo controller is described in the separate installation instructions for the respective servo controller.

Perform test run in preparation for commissioning. Procedure:

1. Connect the servo controller to the computer (operating software must be installed).
   - The use of the operating software is described in the installation instructions for the servo controller used.
2. If the module is supplied with an Afag controller, no further action is required (operating parameters already stored in the controller).
3. When using a different servo controller, special cables must be made and the operating parameters determined.

   ⇨ The test operation can now be carried out.

7.3 Commissioning of the modules

Proceed carefully and follow the instructions step by step when commissioning the modules for the first time:

1. Observe the permissible technical values (➲ chap. 2.8).
   - Payload, movement frequency, moment load
2. First, make sure that there are no persons or tools in the working area.
3. Perform test run:
   - Start with slow movements
   - Then continue under normal operating conditions

   ⇨ Commissioning is completed.

8 Fault elimination

8.1 Safety instructions



Observe the safety instructions in ➲ chap. 2 "Safety instructions" of these installation instructions as well as the safety instructions of the controller manufacturer.

8.2 Fault causes and remedy

The following table contains an overview of possible fault causes and how to proceed to eliminate them.

Fault	Possible cause	Remedy:
Linear feeder does not run - no vibrations noticeable	▪ Mains voltage too low or unstable (or only 180V)	▪ Check the mains voltage, if necessary readjust the feeder (take existing mains voltage into account).
	▪ Connection to the mains supply interrupted	▪ Check connections, drive control unit, control power supply unit.
	▪ Controller is switched off <0>	▪ Switch on the controller <1> or, if a jam control is used, check the jam control signal.
	▪ Controller defective	▪ Electrical check of the unit, use replacement or spare device.
	▪ Magnet damaged, magnet coil burnt out	▪ Electrical test of the magnet, replace damaged magnet. Check settings: 50 Hz position, full wave (excitation frequency = 100 Hz).
	▪ Air gap between magnet and anchor too small (strike) or too large	▪ Adjust air gap according to ➲ chap. 6.4.4.
	▪ A foreign part is stuck in the air gap between magnet and anchor	▪ Remove foreign part.

Fault	Possible cause	Remedy:
Conveyor runs too slowly or no movement visible	Mains voltage too low or unstable (or only 180V)	Check the mains voltage, if necessary readjust the feeder (take existing mains voltage into account).
	▪ Output frequency of the controller set incorrectly.	▪ Set the switch in the controller to the required frequency: 50 Hz, full wave (excitation frequency = 100 Hz)
	▪ Conveyor rail not sufficiently firmly connected to the respective drive	▪ Tighten the fastening screws, check the thread if necessary
	▪ Magnet damaged, magnet coil burnt out	▪ Electrical test of the magnet, replace defective magnet. Check setting: 50 Hz position, full wave (excitation frequency = 100 Hz)
	▪ Air gap between magnet and anchor too small (strike) or too large	▪ Adjust air gap according to ➲ chap. 6.4.4
	▪ Spring fracture results in a change of the system natural frequency	▪ Loosen screws of spring assemblies, check springs, replace broken or defective springs. The cause of spring breakage is usually too much swing amplitude. --> Check air gap!
	▪ Adjustment of the drive faulty, i.e. natural frequency of the system too far away from excitation frequency.	▪ Re-adjust drive (➲ chap. 6.4.3)
	▪ Foreign part jammed in the air gap between magnet and anchor	▪ Remove foreign part
Unstable delivery behaviour, delivery speed varies	Mains voltage too low or unstable (or only 180V)	▪ Check the mains voltage, if necessary readjust the feeder (take existing mains voltage into account).
	▪ Output frequency of the controller set incorrectly	▪ Set the switch in the controller to the required frequency: 50 Hz, full wave (excitation frequency = 100 Hz)
	▪ Conveyor rail not sufficiently connected to the drive.	▪ Tighten the fastening screws, check the thread if necessary
	▪ Magnet damaged, magnet coil burnt out	▪ Electrical test of the magnet, replace damaged magnet. Check settings: 50 Hz position, full wave (excitation frequency = 100 Hz).
	▪ Spring fracture results in a change of the system natural frequency	▪ Loosen screws of spring assemblies, check springs, replace broken or damaged springs. The cause of spring breakage is usually too much swing amplitude. --> Check air gap
	▪ Adjustment of the drive faulty, i.e. natural frequency of the system too far away from excitation frequency	▪ Re-adjust drive (➲ chap. 6.4.3)
	▪ Foreign part jammed in the air gap between magnet and anchor	▪ Remove foreign part.

Fault	Possible cause	Remedy:
Feeders transmit vibrations	▪ Conveyor rail not sufficiently connected to the drive.	▪ Tighten the fastening screws, check the thread if necessary
	▪ Spring fracture results in a change of the system natural frequency	▪ Loosen screws of spring assemblies, check springs, replace broken or damaged springs. The cause of spring breakage is usually too much swing amplitude. --> Check air gap
	▪ Adjustment of the drive faulty, i.e. natural frequency of the system too far away from excitation frequency	▪ Re-adjust drive (➲ chap. 6.4.3).
Conveyor rail lifts off or hits the ground	▪ Conveyor rail not sufficiently connected to the drive.	▪ Tighten the fastening screws, check the thread if necessary.
	▪ Air gap between magnet and anchor too small (strike) or too large	▪ Adjust air gap according to ➲ chap. 6.4.4.
	▪ Spring fracture results in a change of the system natural frequency	▪ Loosen screws of spring assemblies, check springs, replace broken or damaged springs. The cause of spring breakage is usually too much swing amplitude. → Check air gap!
	▪ Adjustment of the drive faulty, i.e. natural frequency of the system too far away from excitation frequency	▪ Re-adjust drive (➲ chap. 6.4.3)
	▪ A foreign part is stuck in the air gap between magnet and anchor	▪ Remove foreign part

9 Maintenance and repair

9.1 General notes

The linear feeders type KLF are almost maintenance-free. Under certain conditions of use, however, signs of wear can occur which must be checked or eliminated by regular maintenance activities.

9.2 Safety instructions

WARNING

Danger of injury due to improper maintenance!



Improperly carried out maintenance activities can cause considerable damage to property and serious injury.

- Only use trained specialist personnel to carry out the activities.
- Always wear personal protective equipment when carrying out maintenance and repair work!

WARNING

Risk of injuries due to uncontrolled parts movements!



Signals from the controller can trigger unintentional movements of the linear feeder, which can cause injury.

- Before starting any work on the linear feeder, switch off the controller and secure to prevent it from being switched on.
- Observe the operating instructions of the controller used!



Also observe the safety instructions in ➲ chap. 2 „Safety instructions“ in this manual.

9.3 Maintenance activities and maintenance intervals

- The maintenance intervals must be strictly observed. The intervals refer to a normal operating environment.

9.3.1 Overview of the maintenance points

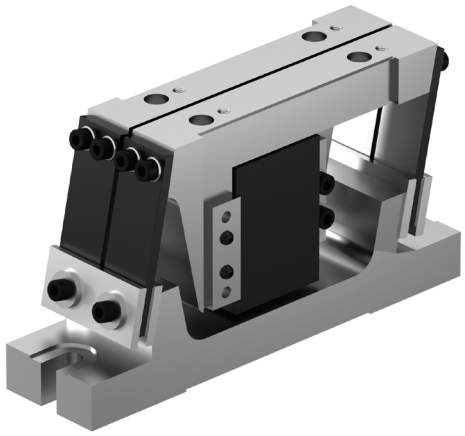


Fig. 13 Maintenance linear feeder KLF

No.	Maintenance point	Maintenance work	Interval	System [On/Off]	Remarks
1	Leaf spring	Check, clean if necessary 	As required	[Off]	-
			▪ Check leaf springs for: - Wear, oxidation (increased resonance frequency) - Settling behaviour (reduced resonance frequency)		

9.3.2 Check leaf springs for wear and oxidation

Depending on the operating condition and environment, the leaf springs can develop an oxidation layer on the contact surfaces, which can impair the vibration behaviour in the long term.

In these cases, it may be necessary to remove and clean the leaf springs. Replace leaf springs in case of high wear (➲ chap. 9.3.4).

When carrying out this work, only one spring assembly may be removed at a time, as otherwise the vibrating parts will be displaced and proper functioning can no longer be guaranteed.

9.3.3 Check spring setting behaviour

Longer storage times can lead to settling of the installed leaf springs. Settling behaviour can result in a reduction in spring stiffness and resonance frequency.

Raise the adjustment plates slightly to compensate for the reduction in resonance frequency.

This eliminates the need to readjust the resonance frequency.

9.3.4 Remove leaf springs

If the leaf springs are dirty or clearly worn, they must be dismantled and cleaned or replaced with new ones.

To remove the leaf springs, please proceed as follows:

1. Support the oscillating parts in a vertical direction.
2. Remove the spring assembly (only remove one spring assembly at a time to avoid displacement of the oscillating parts and thus impairment of function).
3. Clean the leaf springs.



Do not oil or grease leaf springs! This would lead to the springs sticking together and negatively influence the oscillation behaviour

4. Install cleaned or - in case of high wear - replacement spring assembly.

   ⇨ The process is completed.

9.3.5 Further maintenance

Further maintenance is not required, if the ambient conditions listed below are complied with:

- Clean working area
- No use of splash water
- No abrasion or process dusts
- Environmental conditions as specified in the technical data

9.4 Spare and wear parts lists, repairs

Afag Automation AG offers a reliable repair service. Defective linear feeder can be sent to Afag for warranty repair within the warranty period.

After expiry of the warranty period, the customer may replace or repair defective modules or wear parts himself or send them to the Afag repair service.

Please note that Afag does not assume any warranty for modules that have not been replaced or repaired by Afag!

9.4.1 Spare parts

Type	Designation	Mains connection	Order Number
KLF 5	Vibrating magnet	230V/50Hz	15054450
		115V/60Hz	15002283
KLF 7	Vibrating magnet	230V/50Hz	15054450
		115V/60Hz	15002283
KLF 15	Vibrating magnet	230V/50Hz	15215514
		115V/60Hz	15138144
KLF 25	Vibrating magnet	230V/50Hz	15131097
		115V/60Hz	15150127

Tab. 6 Spare parts of the KLF

9.4.2 Wear parts

Type	Designation	Order Number
KLF 5	Leaf spring	15076110
KLF 7	Leaf spring	15137928
KLF 15	Leaf spring	15061275
KLF 25	Leaf spring	15202425

Tab. 7 Wear parts of the KLF

10 Decommissioning and disposal

The linear feeder must be properly dismounted after use and disposed of in an environmentally friendly manner.

10.1 Safety instructions

WARNING

Risk of injury due to improper decommissioning and disposal!



Improperly carried out activities can result in considerable material damage and serious injury.

- Only use trained specialist personnel to carry out the activities.
- Disconnect the media supply before dismounting the module!
- Only remove the linear feeder when the controller is switched off and secured!

10.2 Decommissioning

If the linear feeders are not used for a longer period, they must be properly commissioned and stored as described in ➲ chapter 4.5.

10.3 Disposal

The linear feeders must be disposed of properly at the end of their service life and the raw materials used must be recycled. Observe the legal regulations and company requirements.

The linear feeder must not be disposed of as a complete unit. Dismantle the linear feeder and separate the various components according to type of material and dispose of them properly:

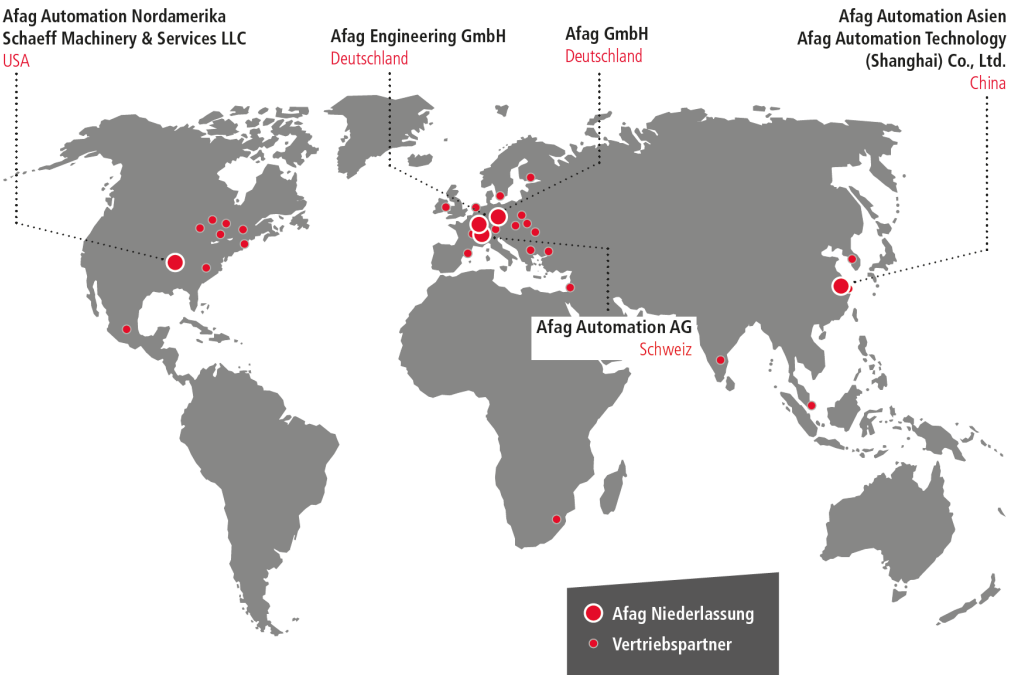
- Scrap the metallic materials.
- Hand over plastic parts for recycling.
- Sort the rest of the components by their material properties and dispose of them accordingly.

NOTICE

Risk to the environment due to incorrect disposal of the linear feeder!

Environmental damage can be caused by improper disposal.

- Electronic parts, electrical scrap, auxiliary and operating materials must be disposed of by approved specialist companies.
- Information on proper disposal can be obtained from the responsible local authorities.


Afag Automation Nordamerika
Schaeff Machinery & Services LLC
USA
Afag Engineering GmbH
Deutschland
Afag GmbH
Deutschland
Afag Automation Asien
Afag Automation Technology
(Shanghai) Co., Ltd.
China
Afag Automation AG
Schweiz
Afag Niederlassung
Vertriebspartner