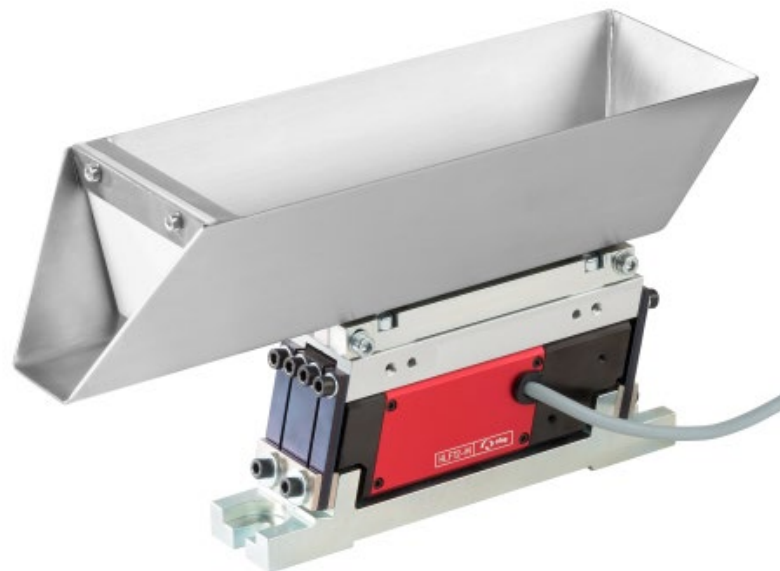


Operating & Installation Instructions

Vibrating refill hopper

NVB07/0.5 | NVB12/1.0 | NVB25/3.0



Translation of the Original Assembly Instructions EN

- Vibrating refill hopper NVB07/0.5 (230 V / 50 Hz) ⇒ Order no: 50398072
- Vibrating refill hopper NVB07/0.5 (115 V / 60 Hz) ⇒ Order no: 50439559
- Vibrating refill hopper NVB12/1.0 (230 V / 50 Hz) ⇒ Order no: 50398076
- Vibrating refill hopper NVB12/1.0 (115 V / 60 Hz) ⇒ Order no: 50439561
- Vibratory refill hopper NVB25/3.0 (230 V / 50 Hz) ⇒ Order no: 50398089
- Vibratory refill hopper NVB25/3.0 (115 V / 60 Hz) ⇒ Order no: 50439562

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 stroke module or other options.

We wish you every success with our products!

With kind regards

Your Afag team

© Subject to modifications

The modules 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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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 vibrating refill hopper NVB to ensure safe and efficient handling and operation.

Consistent compliance with these operating instructions will ensure:

- permanent operational reliability of the module,
- optimal functioning of the module,
- timely detection and elimination of defects (thereby reducing maintenance and repair costs),
- prolongation of the module 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 module.

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 handling system.
- 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 modules 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 gripper and optimal protection of personnel.

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

Every person carrying out installation, commissioning, maintenance work or operating the module 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 vibratory refill hopper is used exclusively for storing and providing product parts. These product parts must have the dimensions and weights specified in (→chap. 3).

The following uses of the modules 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 module.

WARNING



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

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

- The modules 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 modules 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 module.

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 module.

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 modules,
- the operator of the module must draw up work instructions for handling the product parts.
- 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 modules are 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 modules,
- 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 assess the risks that may arise from the use of the module 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 modules.

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 hazards resulting from electricity.

Operator (trained personnel):

Authorized persons who due to their specialized professional training, expertise and experience can identify risks and preventing 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 module, the personnel must use the 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 and modifications

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

Exceptions to this are the processes described in ↻chap. 6.2 "Assembly" and ↻chap. 7.3 "Settings".

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



The modules 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 machine and the technical protective measures taken, there 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 modules have been built according to the state-of-the-art and the applicable health and safety requirements. However, improper use of the module may cause the following hazards to the personnel:

- danger to life and limb of the operator or third parties,
- on the modules 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 module.

WARNING



Danger due to missing or illegible safety instructions on the module!

Missing or illegible safety instructions can lead to dangerous situations.

- The information and labelling attached to the module must be kept in a legible condition.
- Notices and labelling must not be dismantled.
- After replacing cables, lines and components, all labelling on these components must be reapplied.

WARNING



Danger due to removed or bypassed safety devices!

If safety devices are missing or bypassed, there is a risk of personal injury or damage to property!

- The safety devices on the module must not be removed or bypassed!

WARNING



Danger - Do not use in unsuitable environment!

The modules are designed for use in **non**explosive atmospheres.

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

CAUTION



Risk of injuries due to uncontrolled parts movements!

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

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

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 Mechanical hazards

CAUTION



Danger of body parts and clothing being pulled in!

Despite the low belt speed, the use of the appliance may pose a risk to operating personnel due to body parts being drawn in at the points listed below: Fastening strip conveyor belt, tilting conveyor belt, shaft conveyor belt.

- Maintain a sufficient safety distance!
- Never reach into the system during normal operation!

2.8.4 Noise hazards

CAUTION



Noise hazards!

In certain cases, an impermissible noise level may result (e.g. when opening the lid of the noise protection hood for filling or refilling the parts).

- Wear hearing protection during noise-critical activities!

3 Technical data

3.1 Dimensional drawing NVB07/0.5 - NVB25/3.0

Type	NVB07/0.5	NVB12/1.0	NVB25/3.0
A	90 mm	100 mm	151 mm
B	70 mm	86 mm	95 mm
C	145 mm	167 mm	205 mm
D	223 mm	286 mm	384 mm
E	85 mm	95.5 mm	125 mm
F	53 mm	86 mm	124 mm

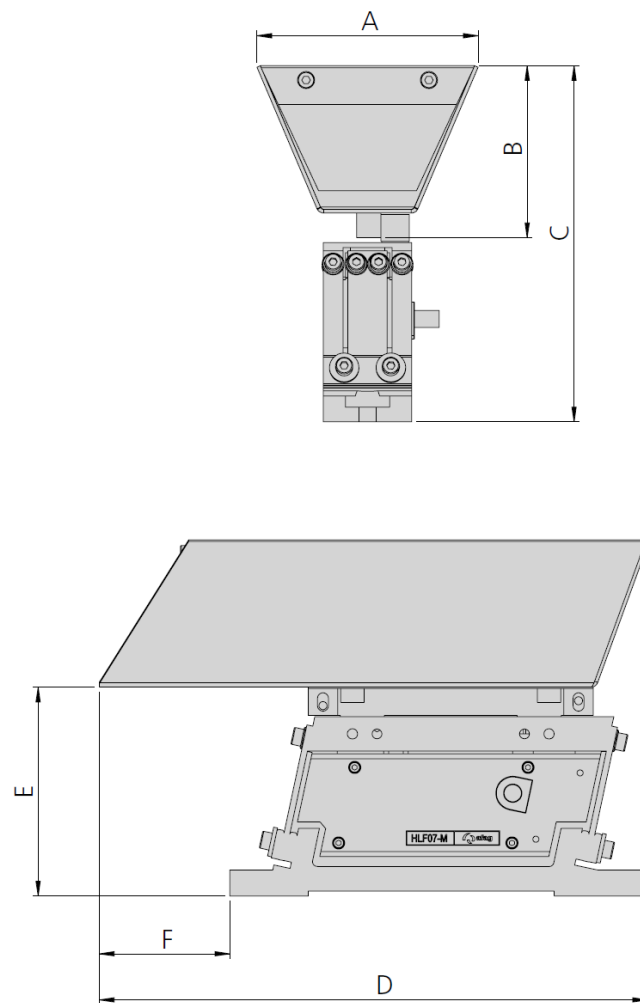


Fig. 1 Dimensional drawing - NVB07/0.5 – NVB25/3.0

Technical data

3.2 Technical data NVB07/0.5 - NVB25/3.0

NVB	
Operating temperature	10 - 45 °C

Type	NVB07/0.5	NVB07/0.5	NVB12/1.0	NVB12/1.0	NVB25/3.0	NVB25/3.0
Order number	50398072	50439559	50398076	50439561	50398089	50439562
Mechanical vibrations	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	19 VA	19 VA	100 VA	100 VA
Net weight	2.6 kg	2.6 kg	4.1 kg	4.1 kg	8.5 kg	8.5 kg
Load volume	0.5 l	0.5 l	1 l	1 l	3 l	3 l
Maximum filling weight	1.7 kg	1.7 kg	3.2 kg	3.2 kg	9 kg	9 kg
Arithmetical mean roughness value Ra	< 0.8 µm	< 0.8 µm	< 0.8 µm	< 0.8 µm	< 0.8 µm	< 0.8 µm
Mean roughness depth Rz	4.5 µm	4.5 µm	4.5 µm	4.5 µm	4.5 µm	4.5 µm
Protection type	IP54	IP54	IP54	IP54	IP54	IP54

3.3 Accessories

3.3.1 Mounting parts

Type	Designation	Note	Order Number
NVB07/0.5	Trimming weight NM07	Weight: 25 g	50217298
	Trimming weight GM07	Weight: 15 g	50216944
	Side plate O-07	-	50197283
NVB12/1.0	Trimming weight NM12	Weight: 50 g	50216719
	Trimming weight GM12	Weight: 25 g	50216708
	Side plate O-12	-	50197284
NVB25/3.0	Trimming weight NM25	Weight: 100 g	50217316
	Trimming weight GM25	Weight: 50 g	50217312
	Side plate O-25	-	50197285

3.3.2 Adjustment aids

Designation	Drive type	Order Number
Distance gauge	HLF07-M	50185560
	HLF12-M	50185560
	HLF25-M	50273499

3.3.3 Controller

Type	Power supply	Order Number	Note
IRG1-S	230V/50Hz	50360105	control without timer function external setpoint input
	115V/60Hz	50360106	



The Afag linear feeders are available in 230V/50Hz and 115V/60Hz versions. Various Afag control units are available to control the linear feeders.

For more information on the controller, see  chap. 6.3.1 and the controller manufacturer's instructions.

4 Transport, packaging and storage

4.1 Safety instructions



CAUTION

Danger of injury due to improper transport equipment!

Improper use of transport equipment can lead to injuries!

- Observe transport and mounting instructions!
- Use the means of transport properly!

NOTICE

Damage to property due to improper lifting!

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

- Lift the module by the base only!



The Afag modules are packed in the original packaging (cardboard box). Carefully remove the module from the original packaging.

4.2 Scope of supply



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

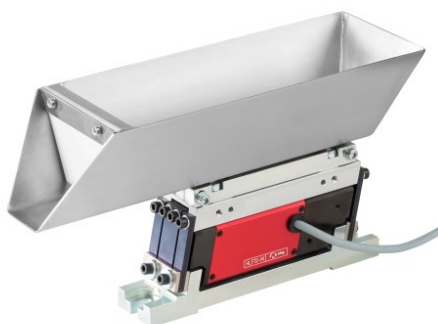


Fig. 2 Scope of delivery NVB

[Unt]	Designation
1 x	Vibrating refill hopper NVB
1 x	Operating & Installation Instructions

4.3 Transport



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

Please note the following for transportation:

- The focus is on the middle of the module.
 - Pallet transport using stable transport trolleys.
-



The weight of the mode depends on the respective version and can be taken from the transport documents.

4.4 Packaging

The module is transported packed on a pallet. If Afag packaging is not used, the module must be packed in shock and dust-proof packaging.

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 module is stored for an extended period, observe the following:

- Store the module 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 module from dirt and dust.

5 Design and description

5.1 Structure of the vibrating refill hopper

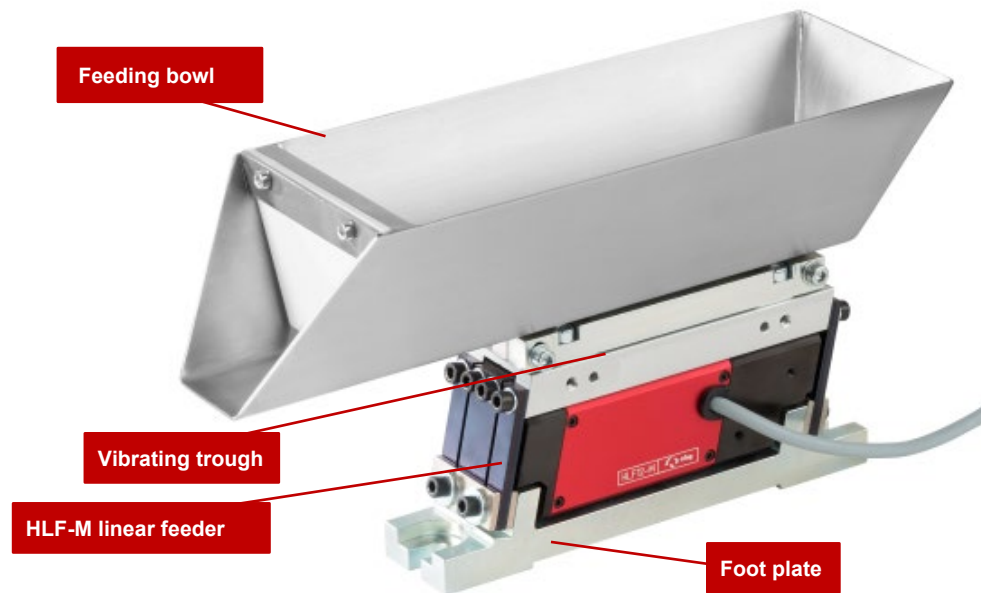


Fig. 3 Design of the NVB (vibratory refill hopper)

5.2 Functional description

The vibrating refill hopper (NVB) is used to storage bulk materials. The transport movement is generated by vibration.

Electromagnetic vibrations are converted in the NVB to store and convey piece goods. The parts are moved in the conveying direction by micro-jumps.

The vibrating refill hoppers NVB consist of a vibrating trough and an Afag linear feeder from the HLF-M series.

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

The upper vibrating part is used as payload for fastening the conveyor rail. The vibrating part at the bottom forms the counterweight. A magnet system (armature-magnet core) is installed horizontally between the two vibrating parts.

Due to the adjustable mass compensation between the payload and counterweight, the free vibrating forces can be eliminated directly in the unit.

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 module. This can be achieved through suitable protective measures (e.g., enclosure, light grid).

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 supply voltage before starting work!
- Ensure that the protective earthing of the power supply is in perfect condition.

CAUTION



Danger of injury by moving components!

The module must not be started up by unauthorised persons during installation and adjustment work. Limbs can be crushed by moving parts and cause serious injuries.

- Attach clearly visible signs before starting work!



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



Observe the safety instructions in ↻ chap. 2 "Safety instructions" of this manual as well as the 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 Mounting instruction

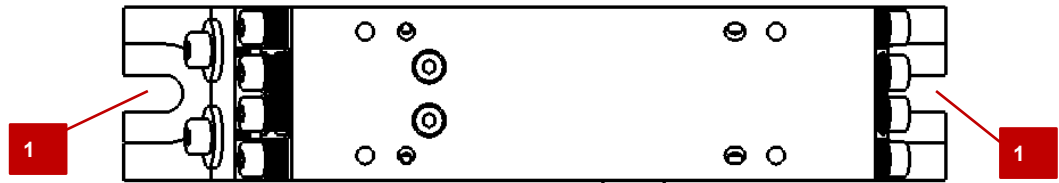


Fig. 4 Design of the NVB (vibrating refill hopper)

The NVB 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 vibrating forces (foundation structure) should be virtually eliminated by a careful mass compensation (☞ chap. 7.3.1).
- The height adjustment must be made by means of appropriate substructures.



Suitable Afag standard components are available for complete station set-ups.

6.3 Electrical connection



The NVB are to be operated in combination with an Afag controller. Only in this combination can optimum conveying behaviour be guaranteed! The IRG1-S controller is available for controlling the linear conveyors.

6.3.1 Connection of the module (control unit)

The NVB is connected to the AC mains 230 V/50 Hz via a control unit type IRG. The design for other mains voltages and mains frequencies (e.g., 115V/60Hz) is also possible.

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.

Notes on the power supply

- The mains supply must be provided by the customer via a residual current circuit breaker.
- The NVB may only be operated with the mains supply specified on the type plate!

6.3.2 Concluding activities

After connecting the module, the following points must be observed:

- Refit dismantled protective devices before recommissioning for the first time.
- Carry out a test drive. Check whether there are any hand tools, screws, aids or other objects in the effective range of the hopper.
- When setting up, ensure that the belt run is not obstructed.
- All 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.

7 Operation

7.1 Safety instructions



Observe the safety instructions in ➔ chap 2 „Safety instructions“ of these instructions



WARNING

Danger due to removed or bypassed safety devices!

If safety devices are missing or bypassed, there is a risk of personal injury or damage to property!

- The safety devices on the module must not be removed or bypassed!

7.2 Commissioning

7.2.1 Test operation control unit

The NVB is connected to the AC mains 230 V/50 Hz via a control unit type IRG1-MS.

The operation of the AFAG controllers is described in the separate installation manual for the respective controllers.

Perform a test run in preparation for commissioning. To turn de connectors proceed as follows:

1. Connect the controller to the computer (operating software must be installed).
 - The use of the operating software is described in the installation instructions for the controllers 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 controller, special cables must be made, and the operating parameters determined.
 - ⇒ The test operation can now be carried out.

7.2.2 Preparatory activities



Check before commissioning:

- Is the NVB set up correctly (➔chap. 7.3) and are all protective devices present and functional?
- Do the rated voltage of the appliance and the local mains voltage match?

The following settings must be checked before commissioning:

- **Filling volume:** For the maximum filling volume and max. filling weight, the permissible limit values of the bunker must be observed (➔chap. 3).
- **Emergency-STOP** devices must remain effective in all operating modes. Unlocking the Emergency-STOP devices must not cause an uncontrolled restart.

7.2.3 First commissioning

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

1. Observe the permissible technical values (⇒ chap 3).
 - Payload, 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.

7.3 Settings

When adjusting the vibrating refill hopper, always adjust the mass compensation first and then the natural frequency.

7.3.1 Adjust mass compensation

The vibrating forces in the base plate of the Afag NVB are compensated almost completely due to the principle of opposing vibrations.

To ensure this vibration force compensation, the following conditions must be observed in the design of the conveyor rail:

1. Payload and counterweight must be matched as precisely as possible. This means that the payload and counterweight must be equal. The table below lists the payloads to be observed for each size.



- The working weight is the total weight of all components attached to the mounting plate including the side plate.
- The mass compensation is verified by simply weighing the payload.

2. The centre of gravity of the payload must be determined correctly.

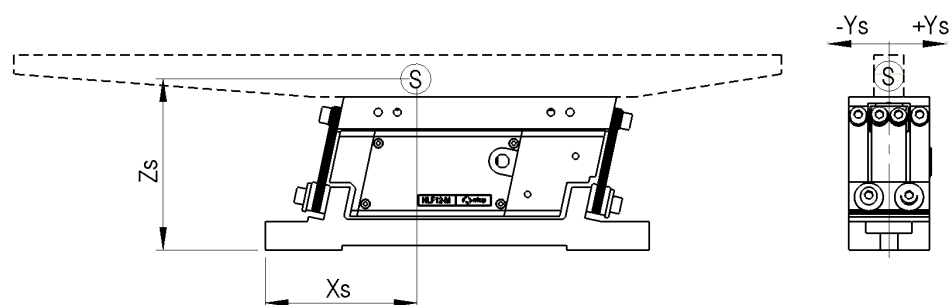


Fig. 5 Area of the centre of gravity using the example of the IBB (exemplary)



The mass compensation is precisely tuned when almost no more residual vibrations can be felt in the base.

With a precisely adjusted mass compensation, the conveying speed is the same on the payload side and the opposite side.

Values for the payload

Type	Ideal payload [kg]	Max. payload [kg]
NVB07/0.5	0.7 ± 0.05	0.9
NVB12/1.0	1.2 ± 0.05	1.5
NVB25/3.0	2.5 ± 0.1	3.0

7.3.2 Setting the natural frequency

The Afag vibratory refill hopper is a spring-mass vibrating system and works by exploiting resonance behaviour. Weights that are not exactly balanced require a spring stiffness modification.

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.

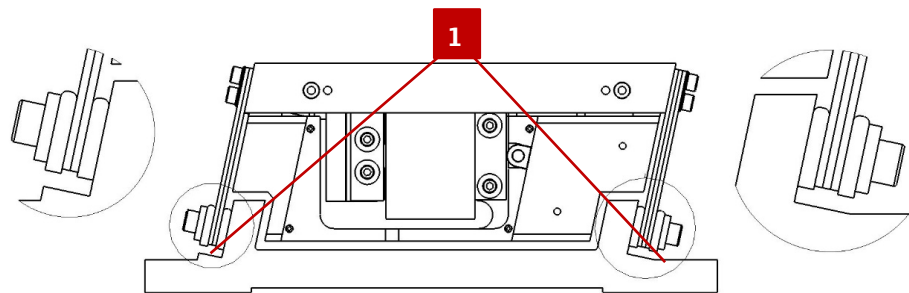


Fig. 6 Spring assembly with adjustment plates

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

1. Place the test part on the conveyor rail and switch on the controller.
2. Reduce the conveying speed of the NVB 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.



The vibratory refill hopper must always be "supercritically" adjusted, i.e., the exciting frequency must be approx. 5% above the natural frequency.

For a 100Hz bowl this means a natural frequency of approx. 103Hz, for a 120Hz bowl a natural frequency of approx. 124Hz.

Procedure if the natural frequency is not set correctly

NOTICE

Material damage due to incorrect setting!

If the linear feeder is not set correctly, the magnet can become hot and burn out. In addition, the conveyor speed may decrease as soon as parts reach the conveyor rail.

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



Adjustment plates upwards ⇒ Natural frequency increases

Adjustment plates downwards ⇒ Natural frequency decreases



- 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.
- Loosen the adjustment plates only at one spring assembly at a time to prevent the vibrating parts from sinking.

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.
- The conveying speed decreases immediately when the screws are loosened.
 - The linear feeder is still too stiffly adjusted.
 - 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.

7.3.3 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
HLF07	230V/50Hz	1.0	± 0,05
	115V/60Hz	1.0	± 0,05
HLF12	230V/50Hz	1.0	± 0,05
	115V/60Hz	1.0	± 0,05
HLF25	230V/50Hz	1.1	± 0,05
	115V/60Hz	1.1	± 0,05

Fig. 7 The specified values only apply to the corresponding power supply

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:

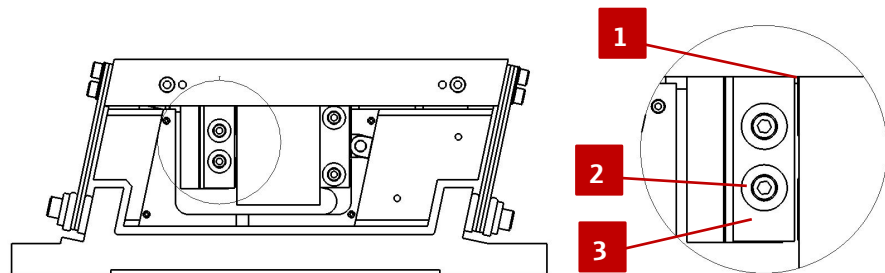


Fig. 8 Anchor fastening

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 (⇒ chap. 7.3.3).
 - The surfaces of the magnetic core and the magnetic anchor must be exactly parallel to each other.
4. Tighten the fastening screws (2) alternately in stages to achieve parallelism of the surfaces.
 - ⇒ The process is completed.

8 Fault elimination

8.1 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 supply voltage before starting work!
 - Ensure that the protective earthing of the power supply is in perfect condition.
-



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

Fault	Possible cause	Remedy:
Linear feeder does not run - no vibrations noticeable	<ul style="list-style-type: none"> ▪ Mains voltage too low or unstable (or only 180V) ▪ Connection to the mains supply interrupted ▪ Controller is switched off <0> ▪ Controller defective ▪ Magnet damaged, solenoid coil burnt out ▪ Air gap between magnet and anchor is too small (strike) or too large ▪ Foreign part is stuck in the air gap between magnet and armature 	<ul style="list-style-type: none"> ▪ Check the mains voltage, if necessary readjust the conveyor (take existing mains voltage into account). ▪ Check connections, drive control unit, control power supply unit. ▪ Switch on the controller <1> or, if a jam control is used, check the jam control signal. ▪ Electrical check of the unit, use replacement or spare device. ▪ Check magnet electrically, replace magnet if necessary, check settings: 50 Hz position, full wave (excitation frequency = 100 Hz). ▪ Set the air gap as specified in the operating instructions ▪ Remove foreign part.
Conveyor runs too slowly or no movement visible	<ul style="list-style-type: none"> ▪ Mains voltage too low or unstable, e.g., only 180V ▪ Output frequency of the controller set incorrectly. ▪ Conveyor rail not sufficiently fastened to the drive. ▪ Magnet damaged, solenoid coil burnt out ▪ Air gap between magnet/anchor too small (strike) or too large ▪ Spring fracture results in a change of the system natural frequency ▪ Adjustment of the drive faulty, i.e., natural frequency of the system too far away from excitation frequency ▪ Foreign part is stuck in the air gap between magnet and armature 	<ul style="list-style-type: none"> ▪ Check mains voltage, adjust if necessary (take existing mains voltage into account). ▪ Set the controller to the required frequency: 50 Hz position, full wave (excitation frequency = 100 Hz) ▪ Tighten the fastening screws, check the thread if necessary Check magnet electrically, replace magnet if necessary, check settings: 50 Hz position, full wave (excitation frequency = 100 Hz). ▪ Set the air gap as specified in the operating instructions ▪ Loosen screws of spring assemblies, check springs, replace broken or damaged springs. The cause of spring breakage: usually too much swing amplitude. --> Check vibrating amplitude! ▪ Recalibrate the drive by changing the spring stiffness: Variation of the position of the adjustment plates. Tighten the screws of the spring assemblies. Setting the conveyor: 🔄 Operating Instructions ▪ Remove foreign part

Fault elimination

Fault	Possible cause	Remedy:
Unstable delivery behaviour, delivery speed varies	<ul style="list-style-type: none"> ▪ Mains voltage too low or unstable, e.g.: only 180 V ▪ Output frequency of the controller set incorrectly ▪ Conveyor rail not sufficiently fastened to the drive. Magnet damaged, magnet coil burnt out ▪ Spring fracture results in a change of the system natural frequency ▪ Adjustment of the drive faulty, i.e., natural frequency of the system too far away from excitation frequency ▪ Foreign part is stuck in the air gap between magnet and armature 	<ul style="list-style-type: none"> ▪ Check the mains voltage, if necessary adjust conveyor (take existing mains voltage into account) ▪ Set the controller to the required frequency: 50 Hz position, full wave (excitation frequency = 100 Hz) ▪ Tighten the fastening screws, check the thread if necessary ▪ Check magnet electrically, replace magnet if necessary, check settings: 50 Hz position, full wave (excitation frequency = 100 Hz). ▪ Loosen screws of spring assemblies, check springs, replace broken or damaged springs. The cause of spring breakage is usually too much vibrating amplitude. --> Check vibrating amplitude ▪ Recalibrate the drive by changing the spring stiffness: Variation of the position of the adjustment plates. Tighten the screws of the spring assemblies. Setting the conveyor: ↻ Operating Instructions ▪ Remove foreign part.
Feeders transmit vibrations	<ul style="list-style-type: none"> ▪ Vibrating rail not sufficiently fastened to the drive. ▪ Spring fracture results in a change of the system natural frequency ▪ Adjustment of the drive faulty, i.e., natural frequency of the system too far away from excitation frequency 	<ul style="list-style-type: none"> ▪ Tighten the fastening screws, check the thread if necessary ▪ Loosen screws of spring assemblies, check springs, replace broken or damaged springs. The cause of spring breakage is usually too much vibrating amplitude. --> Check vibrating amplitude ▪ Recalibrate the drive by changing the spring stiffness: Variation of the position of the adjustment plates. Tighten the screws of the spring assemblies. Setting the conveyor: ↻ Operating Instructions

Fault	Possible cause	Remedy:
Conveyor rail lifts off or hits the ground	<ul style="list-style-type: none"> ▪ Conveyor rail is not firmly fixed to the drive. ▪ Air gap between magnet and armature too small (strike) or too large ▪ Spring fracture results in a change of the system natural frequency ▪ Adjustment of the drive faulty, i.e., natural frequency of the system too far away from excitation frequency ▪ Foreign part jammed in the air gap between payload and counterweight 	<ul style="list-style-type: none"> ▪ Tighten the fastening screws, check the thread if necessary. ▪ Set the air gap according to the specifications in the operating instructions! ▪ Loosen screws of spring assemblies, check springs, replace broken or damaged springs. The cause of spring breakage is usually too much vibrating amplitude. --> Check vibrating amplitude ▪ Recalibrate the drive by changing the spring stiffness: Variation of the position of the adjustment plates. Tighten the screws of the spring assemblies. Setting the conveyor: ↻ Operating Instructions ▪ Remove foreign part

9 Maintenance and repair

9.1 General notes

The NVB require minimal maintenance. Subsequent maintenance activities ensure that the modules are in optimum operating condition.

9.2 Safety instructions

DANGER



Risk of injury due to 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.
-

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 modules, which can cause injury.

- Before starting any work on the module, 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

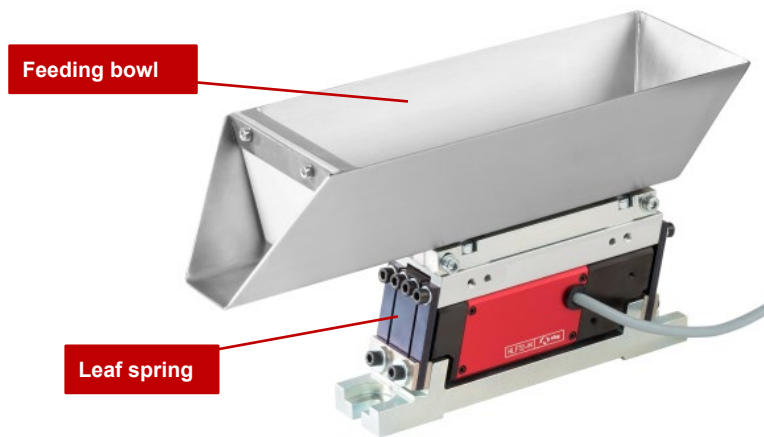





Fig. 9 Maintenance NVB

No.	Maintenance point	Maintenance work	Interval	System [On/Off]	Remarks
1	Feeding bowl	Cleaning 	As required	[Off]	- ▪ Observe notes → chap 9.3.2!
2	Leaf spring	Check, remove if necessary, clean / replace  	As required	[Off]	- ▪ Removal, cleaning, replacement → chap. 9.3.3!

9.3.2 Notes on cleaning

NOTICE

Risk of material damage if the following instructions are not observed!

If cleaning agents or cleaning methods other than those listed are used, there is a risk of permanent damage to components and the function of the module can no longer be guaranteed.

- Only use the specified cleaning agents!
- It is essential to observe the cleaning methods!

WARNING



Risk of injury from volatile substances!

The cleaning agents to be used contain volatile substances that can cause irritation or injury to the eyes or respiratory tract.

- Wear safety glasses.
- Ensure sufficient ventilation!

Cleaning the feeding bowl (according to its coating):

Bowl coating:	Cleaning agent:	Cleaning method:
Hard anodised / Inox raw or polished	Benzine or spirit	Ultrasonic bath
Metaline	Soapy water	Wash off with a damp cloth, allow to dry
Habasite light green TS10	Hoover	Vacuum cleaning
Polyamide pot raw, Habasit white, dark green Polyurathan red, yellow, grooved Nextel coating	Benzine or spirit	Wipe out with a damp cloth and dry again, cleaning agent must not be poured into the feeding bowl. Feeding bowl must not be immersed in cleaning bath.
Teniferated, blue chromated	Nitro thinner	Dampen a rag with nitro thinner and rub with it
Colour sprayed / painted / powder coated	Soapy water / universal cleaner	Wipe with a damp cloth
PET / Makrolon / Plexi	Hoover and anti-static spray	Vacuum clean before rubbing down, then spray with an anti-static spray and rub off

9.3.3 Remove leaf springs

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.

It may be necessary to remove the leaf springs to clean them or replace them if they are very worn.

To remove the leaf springs, please proceed as follows:

1. Support the vibrating parts in a vertical direction.
2. Remove the spring assembly (only remove one spring assembly at a time to avoid displacement of the vibrating 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 vibrating behaviour.

4. Install cleaned or - in case of high wear - replacement spring assembly.
⇒ The process is completed.

9.4 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.

9.5 Spare and wear parts

Afag Automation AG offers a reliable repair service. Defective modules 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, wear parts himself, or send them to the Afag repair service.

Spare parts

Type	Designation	Mains connection	Order Number
NVB07/0.5	Vibrating magnet	230V/50Hz	15054450
		115V/60Hz	15002283
NVB12/1.0	Vibrating magnet	230V/50Hz	50277472
		115V/60Hz	50277904
NVB25/3.0	Vibrating magnet	230V/50Hz	50270048
		115V/60Hz	50280087

Wear parts

Type	Designation	Order Number
NVB07/0.5	Leaf spring	50203877
NVB12/1.0	Leaf spring	50203471
NVB25/3.0	Leaf spring	50254134



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



Spare parts for the vibratory refill hopper are available on request.

10 Decommissioning and disposal

The modules must be properly dismantled 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 dismantling the module!
 - Only remove module when the controller is switched off and secured!
-

10.2 Decommissioning

If the modules are not used for a longer period, they must be properly commissioned and stored as described in ↻ chap. 4.5.

10.3 Disposal

The module 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 modules must not be disposed of as a complete unit. Dismantle the modules 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 modules!

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.
-

