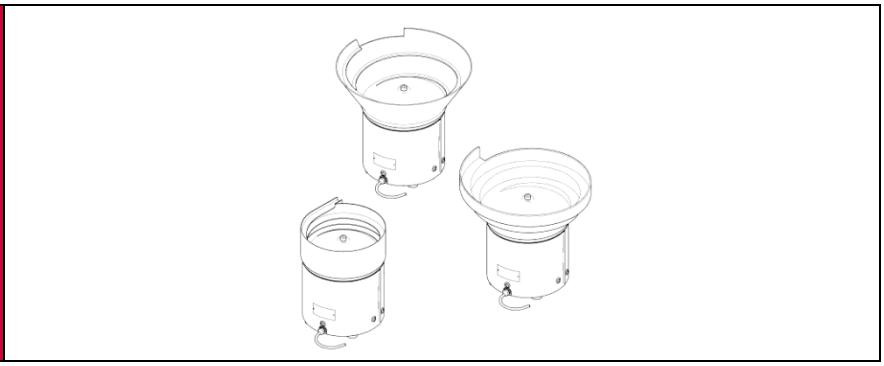
# Bowl feeder
# WV151-1 / WV201-1 / WV310-1



**Translation of original operating instruction**

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## This operation instruction applies to:

| Type | | | Order number |
|---|---|---|---|
| Bowl feeder WV151-1 | 25° | left | 11005656 |
| | | right | 11005657 |
| | 20° | left | 11015890 |
| | | right | 11015891 |
| Bowl feeder WV201-1 | 25° | left | 11005659 |
| | | right | 11005660 |
| | 20° | left | 11015892 |
| | | right | 11015893 |
| Bowl feeder WV310-1 | 25° | left | 11005665 |
| | | right | 11005666 |
| | 20° | left | 11015894 |
| | | right | 11015895 |


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# 1 Declaration of incorporation for the incomplete machine

**Declaration of incorporation according to the EC-Machinery-Directive 2006/42/EC, Annex II B**

The manufacturer: Afag GmbH, Wernher-von-Braun-Straße 1, D-92224 Amberg

www.afag.com – Tel. +49 (0)9621 650 27-0

hereby declares, that the incomplete machine: **Bowl feeder**

Designation: **WV151-1 / WV201-1 / WV310-1**

Complies with the basic safety and health requirements of the Machinery Directive **2006. /42/EC Annex I**.

The incomplete machine also complies with the following:

| |
|---|
| Relevant EC Directives: |
| Machinery-Directive 2006/42/EC |
| Low Voltage Directive 2014/35/EU |
| EMC- Directive 2014/30/EU |
| Applied harmonised standards: |
| EN ISO 12100-2010 |

The technical documentation for this incomplete machine was prepared in accordance with Annex VII, Part B. Upon request, the manufacturer undertakes to transmit these technical documents electronically to national authorities, if requested.

Authorised representative for the compilation of the technical documentation:

Claus Piechatzek
Development / Product Management ZTK
Afag GmbH

**The start-up of the incomplete machine is prohibited until installed in a complete machine that complies with the regulations of the EC Machinery Directive and until the EC Declaration of Conformity according to Annex II A is available.**

City, Date

Amberg, 11.11.2014

Company: Afag GmbH

First name, last name

Mr. Klaus Bott

Managing Director

Afag GmbH

# 2 Safety instructions

## 2.1 Notes on symbols and instructions

Symbols: Assembly and commissioning must be carried out by qualified personnel only and according to these operating instructions.

Please observe the meaning of the following symbols and notes. They are grouped into risk levels and classified according to ISO 3864-2.

| **DANGER** | |
|---|---|
| | **Indicates an immediate threatening danger.**<br>**Non-compliance with this information can result in death or serious personal injuries (invalidity).** |

| **WARNING** | |
|---|---|
| | **Indicates a possible dangerous situation.**<br>**Non-compliance with this information can result in death or serious personal injuries (invalidity).** |

| **CAUTION** | |
|---|---|
| | **Indicates a possibly dangerous situation.**<br>**Non-compliance with this information can result in damage to property or light to medium personal injuries.** |

| **NOTE** | |
|---|---|
| | **Indicates general notes, useful operator tips and operating recommendations which don't affect safety and health of the personnel.** |

## 2.2 Basic safety information

This operating manual provides the basis for the safe use and operation of the bowl feeder. This operating manual and, in particular, the included safety instructions have to be observed by all individuals working with and on the bowl feeder. In addition, all rules and regulations concerning the accident prevention applicable for the site of operation are to be complied with.

The operating manual must always be kept at the site of operation of the bowl feeder.

## 2.3 Appropriate use

The bowl feeders are intended for storing, transporting, separating and arranging component parts of different sizes, forms and materials.

The workpieces must meet the following requirements in order to ensure a problem-free operation:

- they must be free of oil, grease and burrs
- they must not be sticky
- they must not be statically charged
- they must not be magnetic (no self-magnetism)
- they must be free of dirt and not be mixed with foreign parts
- rubber parts can be powdered with talcum

| **⚠ WARNING** | |
|---|---|
| | **The KLF may not be used:**<br>a) in damply and wet area<br>b) in temperature lower than 10°C or higher than 50°C<br>c) in areas where readily flammable media are present<br>d) in areas where readily explosive media are present<br>e) in heavy polluted or dust- laden area<br>f) in aggressive area (e.g. saliferous atmosphere) |

# 3 Description of the Bowl feeder

## 3.1 General

In combination with a conveyor bowl, the bowl feeder is used for storing, transporting, separating and arranging bulk material. The material is moved by vibrations. Parts are moved by micro throws in the feeding direction.

The mass of the bowl should not exceed the value specified in chapter 3.4 as this cannot ensure optimum transport behaviour.

## 3.2 Functional description

A Bowl Feeder is a unit which transforms magnetic oscillations in order to use the feeding of work pieces.

The basic construction of a bowl feeder comprises the following elements.

(see Figure 1)

1 Material to be conveyed

2 Conveyor line

3 Leaf spring

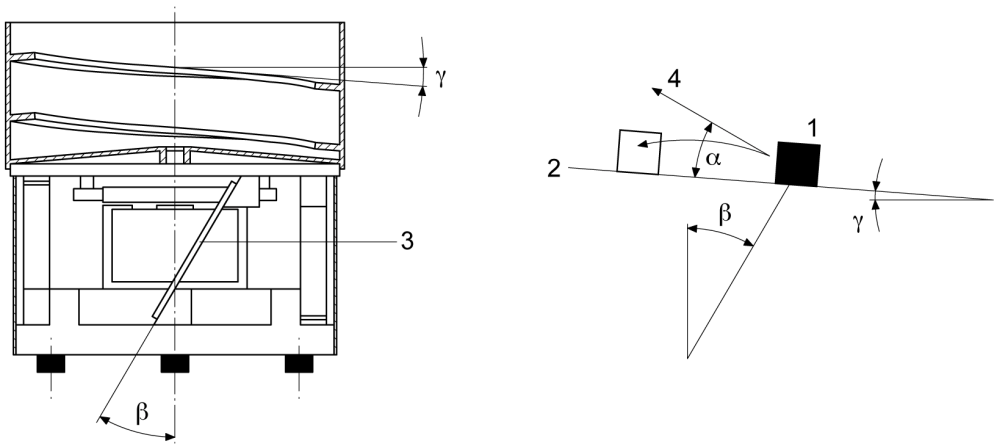
4 Projectile direction

α Projectile angle

β Angle of leaf spring inclination

γ Pitch angle of the spiral

**Figure 1**




The magnet, connected to the support, creates a force which attracts reps. releases the oscillating plate dependent on the oscillation frequency of the power supply.

The pulsating movement of the oscillation plate causes the material to jump from the rail at each oscillation and is conveyed as a result of the angle of inclination of the leaf springs.

On a cycle of the 50Hz alternating current supply, the magnet achieves twice its maximum pulling force while this is independent of the direction of the current flow. The magnet thereby produces an oscillating frequency of 100Hz. This 100Hz oscillation is necessary to achieve a smooth and gentle transport for small or light work pieces.

With heavy or large work pieces however, it is necessary to use an oscillating frequency of 50Hz. A half-wave of the mains supply is thereby blocked.

## 3.3 Definition of the feed direction

The feed directions for the WV are defined as follows:

***Left-hand (L)**, in **anti-clockwise** direction*

***Right-hand (R)**, in **clockwise** direction*

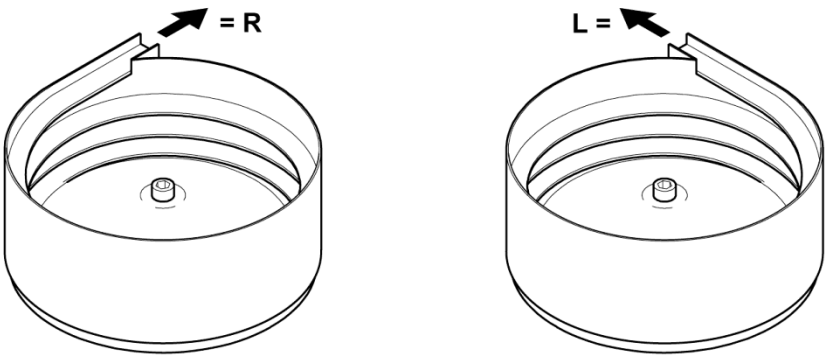



**Figure 2**

## 3.4 Technical Data

**Figure 3**

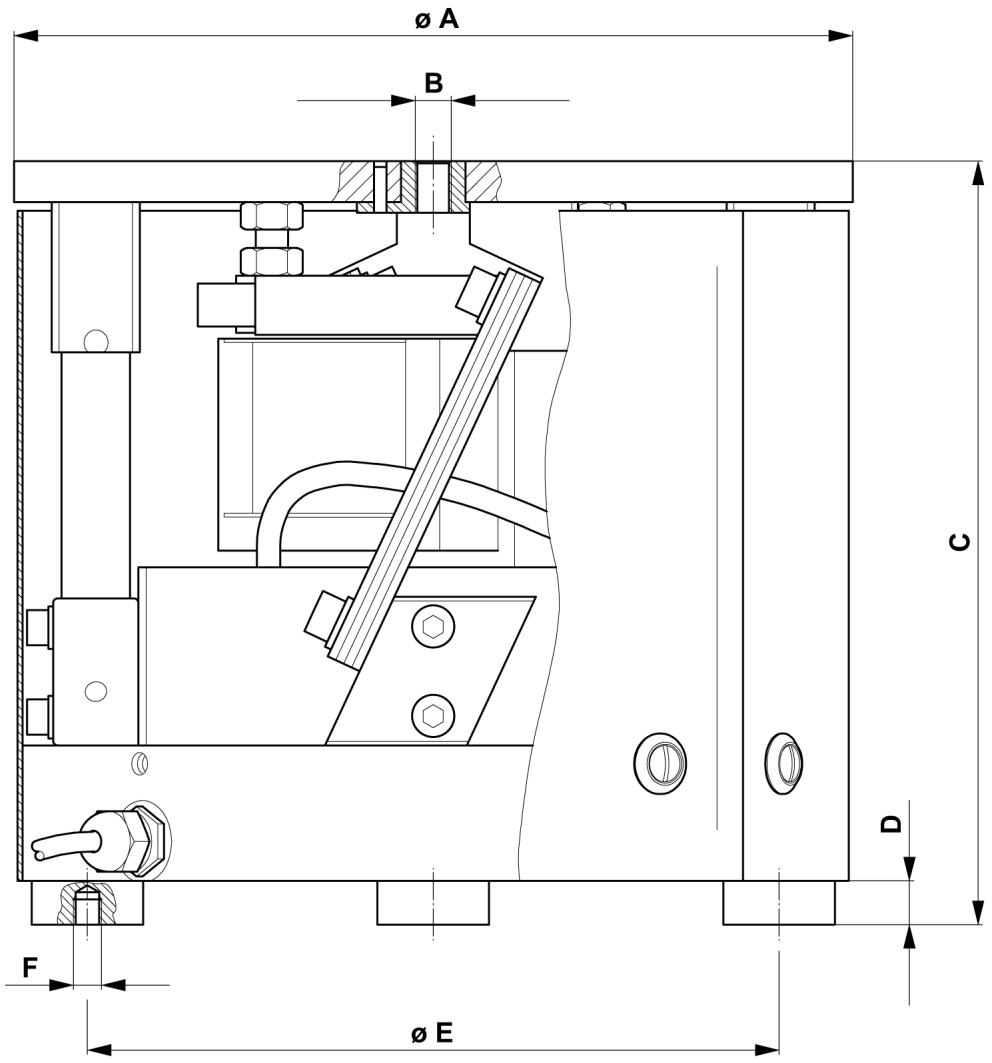


**Table 1:** *Technical Data*

| Description | | Units | WV 151-1 | WV 201-1 | WV 310-1 |
|---|---|---|---|---|---|
| Dimensions | A | [mm] | 146 | 194 | 294 |
| | B | [mm] | M6 | M8 | M8 |
| | C | [mm] | 110 | 180 | 180 |
| | D | [mm] | 6 | 10 | 9 |
| | E | [mm] | 120 | 160 | 226 |
| | F | - | M5 (4x) | M6 (4x) | M6 (4x) |
| Operating voltage | | [VAC] | 230 / 115 | | |
| Power frequency | | [Hz] | 50 / 60 | | |
| Coil resistance (single coil) | | [Ohm] | 80 | 16 | 16 |
| Maximum current draw | | [A] | 0,3 | 0,8 | 0,8 |
| Device fuse | | [A] | F 0.3 | F 0.8 | F 0.8 |
| Protection class | | [IP] | 54 | | |
| Oscillation frequency (full wave) | | [min-1] | 6000/7200 | 6000/7200 | 6000/7200 |
| Weight (without bowl) | | [kg] | 6 | 17 | 36 |
| Maximum filling weight | | [kg] | 0,8 | 6 | 8 |
| Thickness of spring package | | [mm] | 5 | 14 | 21 |
| Spring thickness (standard) | | [mm] | 0.5/1/1.5/2 | 1/1,5/2/2.5/3 | 1/1,5/2/2.5/3 |
| Air gap (magnet anchor bolt) | | [mm] | 0.3-0.5 | 0.3-0.7 | 0.3-0.8 |
| Installed magnet type | | - | EL 60-20 | EL 84-29 | EL 84-29 |
| Magnet performance | | [VA] | 66 | 176 | 176 |
| Environmental conditions for operation: Temperature range | | [°C] | +10 to +45 | | |
| Noise emission: Continuous noise pressure level (without transported material) | | [dB] | <70 | | |
| Measuring height/measuring distance | | [m] | 1,6 / 1 | | |
| Measurement direction with respect to the noise source | | [°] | 90 | | |
| Measurement method | | - | A evaluation | | |

**NOTE**

**The noise level can be reduced by using noise protection hoods.**

# 4 Assembly instructions

## 4.1 Transport

| **⚠ WARNING** | |
|---|---|
| | **Improper use of transport means (industrial trucks, cranes, technical aids, sling gear etc.) may lead to bruises and other injuries.**<br>**Required behaviour:**<br>- **Observe and follow the transport and maintenance instructions**<br>- **Proper use of transport means** |

| **⚠ CAUTION** | |
|---|---|
| | **During transport, the bowl feeder must only be held by the base.**<br>**Neither the bowl nor the selection elements are lifting points.** |

## 4.2 Installing the unit

For operation, the WV must always be mounted on a sufficiently pro-portioned foundation. The type of fixing can be seen in the following drawings:

WV with base plate (see Figure 4)

WV with base plate and mounting foot (see Figure 5)

WV with base plate and adjustment foot (see Figure 6)

When assembling the WV, it must be ensured that the base is horizontal.

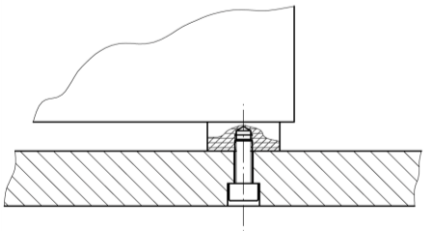


**Figure 4**

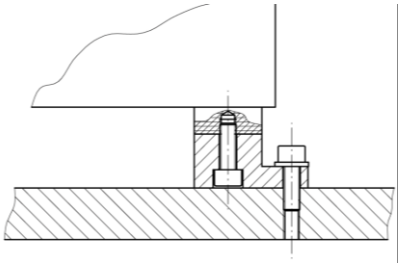


**Figure 5**

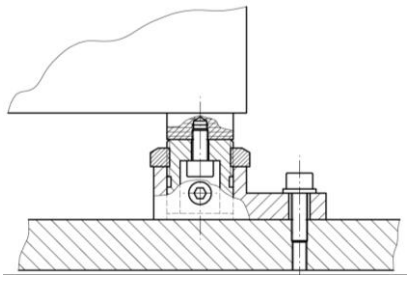


**Figure 6**

## 4.3 Fixing the bowl

The bowl is connected to the vibration plate by means of a central screw (**1**).

There is no prescribed tightening torque.

Tighten the screws securely with Allen key

**WV 151-1** **screw M6**

**WV 201-1** **screw M8**

**WV 310-1** **screw M8**

| NOTE | |
|---|---|
| | **After loosening or removing the bowl from the vibration plate, it must be remounted in exactly the same position.** |

It is recommended that the positions of the bowl and the vibration plate are marked before removing (see Figure 8).

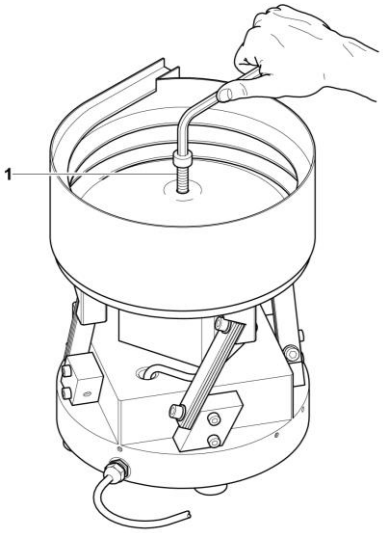



**Figure 7**

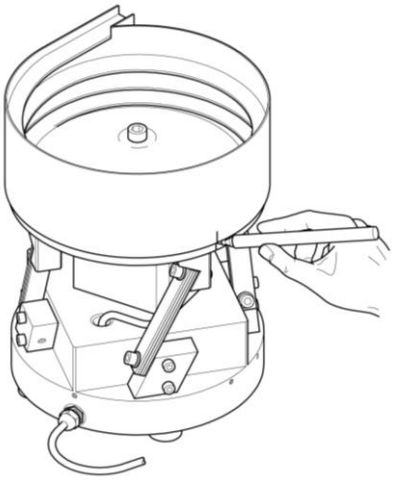


**Figure 8**

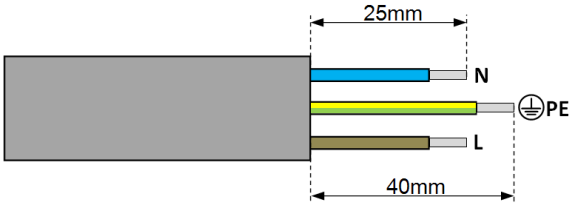
## 4.4 Power supply

| **WARNING** | |
|---|---|
| | ▪ **Any work performed on the electrical supply may only be performed by trained, authorised, qualified personnel!**<br>▪ **The power supply must be protected by an FI switch (provided by the customer).**<br>▪ **The bowl feeder may only be operated with the power supply specified on the name plate.** |

The control device IRG1-S is used for the activation of the bowl feeder. The MSG801 or MSG802 can also be used. Please note that an additional CEE connector plug is required for the MSG controllers (Order number: 11006982)

Installation of the plug is only to be carried out by technically qualified personnel.

**Figure 9:** *End of the wire for additional plug*




# 5 Operating instructions

## 5.1 Correlations between the transport speed and the WV spring packages

Basically the WV and bowl are adjusted in the standard configuration. This means that all oscillating elements are set optimally.

The following factors however influence the combination WV/bowl:

- the parts to be conveyed (size, weight, shape, material and condition)
- the feed rate
- the quantity filled
- the selection elements in the bowl (construction and arrangement). Selection elements always present additional weight
- outlet in the bowl
- support
- surrounding (are there other oscillating components with a disturbing influence)

| **WARNING** | |
|---|---|
| | **Unplug the power cable before proceeding with further actions!** |

1. check control unit settings (see separate control unit's operating instructions)
2. Remove the casing and check that all springs and fixing screws are tight.
3. check the magnet distance and set if necessary (see Chapter 6.5)
4. Switch on the bowl feeder and set the controller regulator to 90% (SE Position 8).
5. **Slowly** unscrew the lower fixing screw on a spring package (see Figure 10). Loosing this screw alters the transport speed of the parts in the bowl

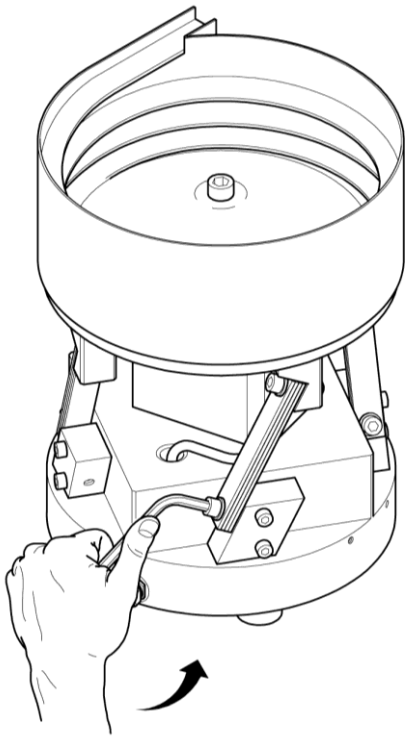


**Figure 10**

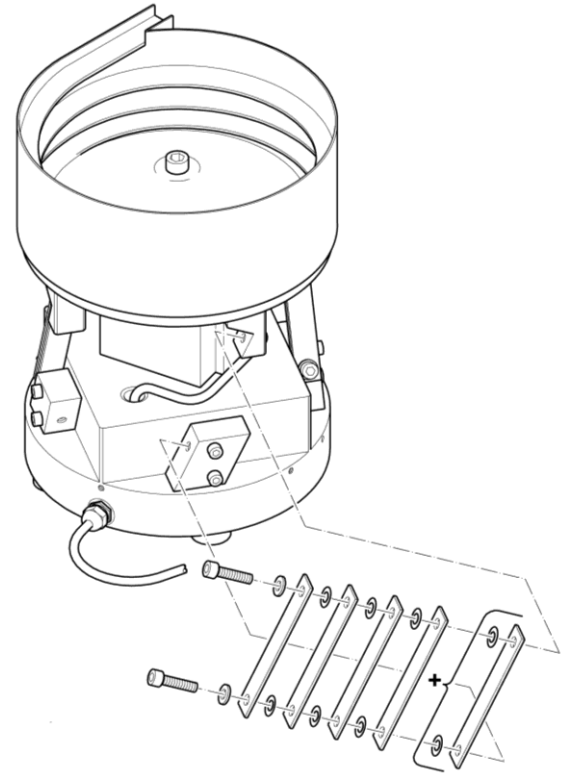


**Figure 11**

The result:

**Transport speed is reduced**

- insert additional springs
- at first, one spring in ***one spring package***
- if this is insufficient, then one spring with spacer plate is to be inserted into the individual spring packages ***one by one*** (see Figure 11)

**Transport speed is increased**

- remove springs (see chapter 6.3)
- the procedure and sequence are the same as for inserting springs

**Irregular transport speed at bowl perimeter**

- a spring must be removed from the *slower* location
- a spring must be inserted at the *faster* location

**Erratic transport speed between two spring packages**

- seen, from the direction of transport, a spring must either be removed or inserted behind the area of erratic transport speed.

| ⚠ CAUTION | |
|---|---|
| | **The casing must be replaced after each procedure!** |

## 5.2 Setting the distance between the plate and the support base

This setting is only necessary when:

- all spring packages have been exchanged or reassembled
- the WV has been dismantled

| ⚠ WARNING | |
|---|---|
| | **Before removing the casing, unplug the mains cable!** |

| NOTE | |
|---|---|
| | **It is recommended that the bowl (1) is removed for this procedure!** **(see Figure 12)** |

1. Remove the casing (2)
2. Slightly loosen the spring package screws (3).
3. Hammer the oscillating plate (4) first into the upper position (see Figure 13) using a plastic hammer, and then hammer downwards until a height tolerance of ±1.0mm and a parallelism tolerance of 0.1 mm with respect to the support base have been achieved. (see Figure 14)
4. Retighten the spring package screws (3)
5. Replace the bowl (1) and carry out any necessary settings (for this purpose, see chapter 5.1)

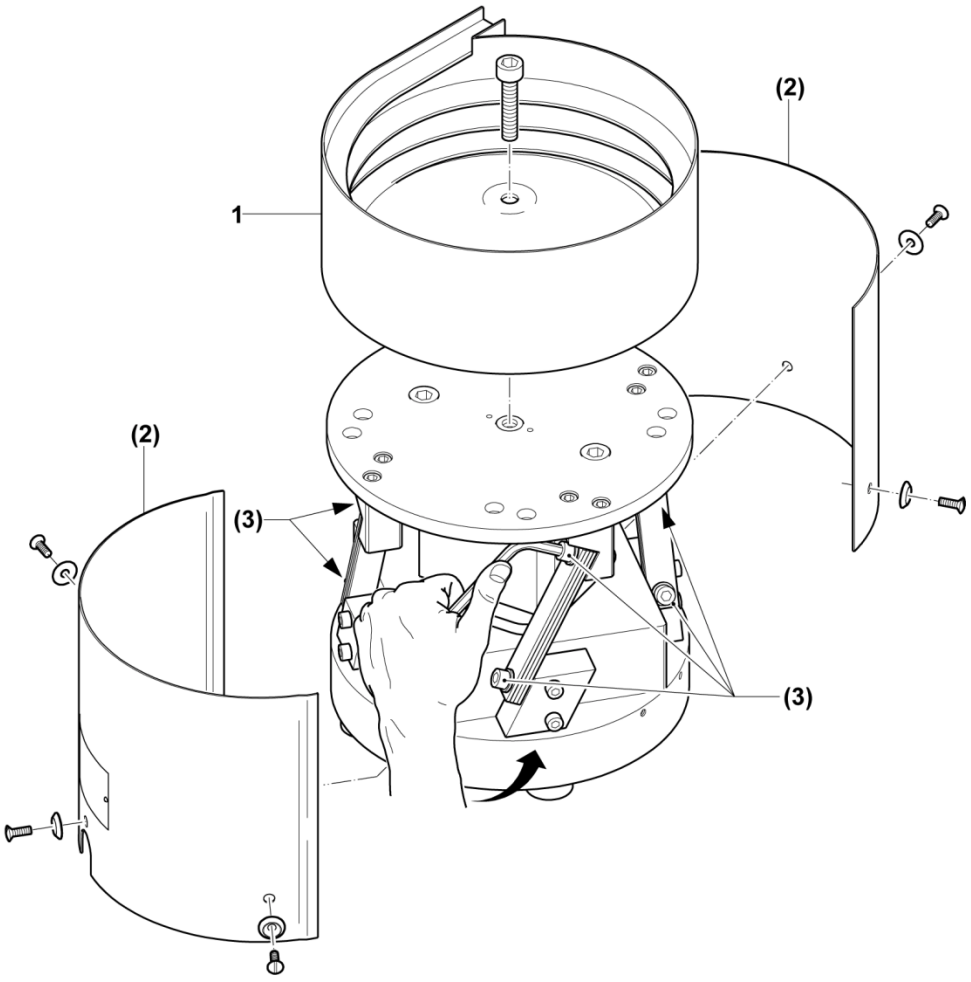



**Figure 12**

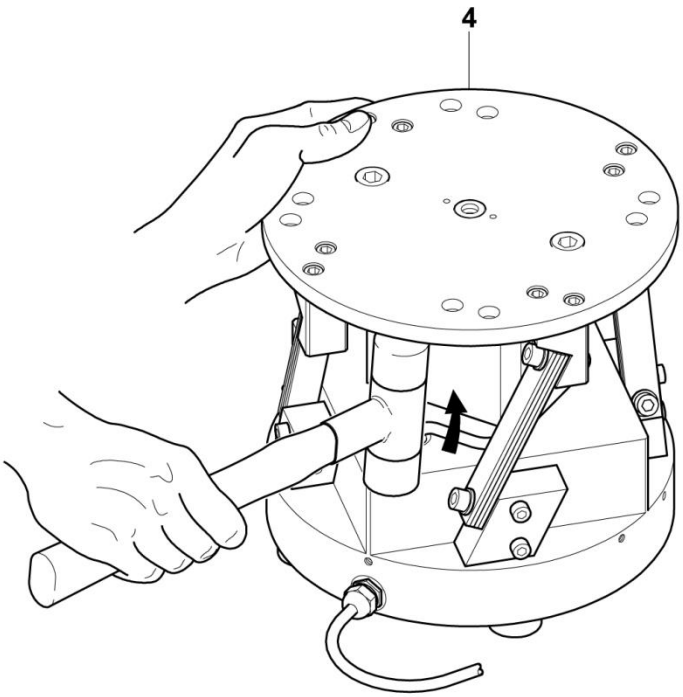
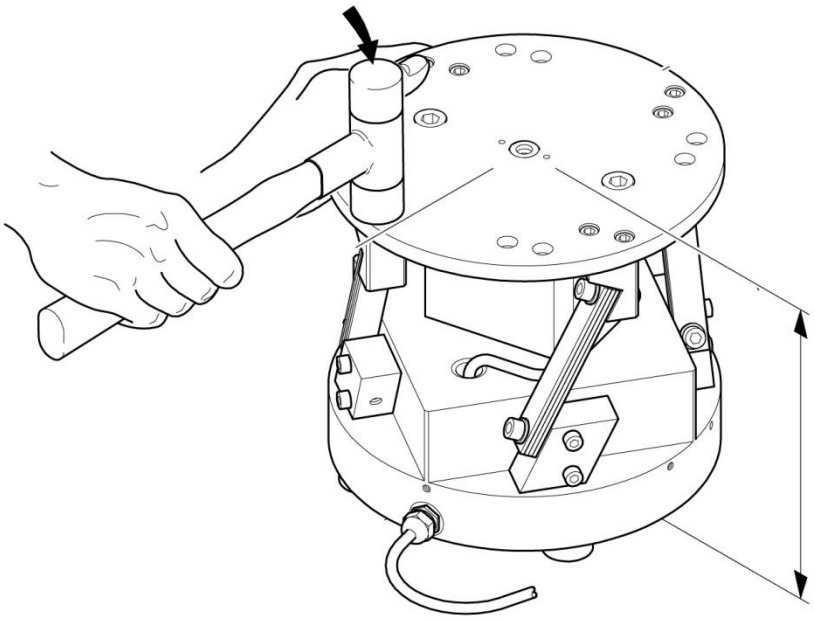



**Figure 13**



**Measure C:**
**Length tolerance ±1.0mm**
**Parallelism ±0.1mm**

**Figure 14**

## 5.3 Standard operation

No further settings are required for standard operation once the control is switched on. An uninterrupted operation only requires the re-filling of the feeder bowl.

| ⚠ CAUTION | |
|---|---|
| | **The bulk material must be filled into the middle of the conveyor bowl. Otherwise the orientation system might be damaged or the required capacity might not be achieved as falling parts can get jammed in the orientation system.** |

| ⚠ CAUTION | |
|---|---|
| | **Under certain circumstances an inadmissible noise level may occur (e.g. when opening the cover of the noise protection hood for filling in parts).**<br>**Required behaviour:**<br>**Wear ear protection when working at critical sound levels** |

# 6 Maintenance guidelines

| WARNING | |
|---|---|
| | **The electrical equipment of the bowl feeder must be checked at regular intervals. Loose connections, burnt or damaged cables are to be removed immediately!** |

| NOTE | |
|---|---|
| | **Check all visible screws for tightened.** |

## 6.1 Troubleshooting and fault repair

| WARNING | |
|---|---|
| | ▪ **Electrical work must only be carried out by trained personnel!**<br>▪ **Before removing the casing, unplug the power cable!** |

Interruptions caused by defective components must be repaired by replacing the defective component, only.

| NOTE | |
|---|---|
| | **Defective components must only be replaced by Afag original spare parts.** |

| Bowl feeder does not run after switch on | |
|---|---|
| **Cause of fault:** | **Fault repair** |
| Plug not connected | Connect plug |
| Connecting cable between bowl feeder and controller not plugged in | Connect plug |
| Regulator on controller set to „0“ | Turn regulator to position |
| Defective fuse in control unit | Replace fuse |
| Bowl feeder lacks performance after operating for a certain length of time | |
| **Cause of fault:** | **Fault repair** |
| The spring package fixing screws have become loose | Remove the casing and retighten all spring package screws |
| The screw securiting the bowl to the vibration plate has become loose | Retighten the screw |
| The air gap between the magnetic coil and the anchor bolt is no longer correct | Remove the casing and readjust the air gap (see chapter 6.5) |
| Spring broken | Remove the casing and replace the broken spring (see chapter 6.3) |
| Regulator on control unit has moved | Readjust regulator |
| Bowl feeder develops loud noises | |
| **Cause of fault:** | **Fault repair** |
| The casing has become loose | Tighten als casing screws |
| The magnetic coil or anchor bolt have become loose | Tighten the screws (see chapter 6.4) |
| Foreign substance between bowl outlet and line | Remove foreign substance |
| Air gap between bowl outlet and line is too small | Loosen and slightly turn the bowl. *Afterwards, make sure* to check the bowl outlet / line crossovers |
| Air gap too tight, magnetic coil and anchor bolt are in contact | Adjust air-gap (see chapter 6.5) |
| Bowl feeder does not run at certain levels oft he regulator scale | |
| **Cause of fault:** | **Fault repair** |
| Potentiometer defective | Replace potentiometer (see „Controller operating instructions“) |

## 6.2 Cleaning

| Coating: | Detergent: | Cleaning methode: |
|---|---|---|
| hard-anodised / Inox polished | Alcool or spirit | Ultrasonic bath |
| Metaline | Soap wather | clean with a damp cloth, let it dry |
| Habasit light green | neither | vacuum cleaner |
| Habasit white, dark green Polyurethane red, yellow Nextel | Alcool or spirit | clean with a damp cloth and let it dry. Don't fill detergent into bowl. Don't placed bowl into a cleaning bath |
| Soft nitrated, blue chromized | Diluent for cellulose lacquers | Clean with a cloth moistened with diluent for cellulose lacquers and wipe |
| Spray-coated / lacquered / powder-coated | Soap water / universal cleaner | Clean with a moist cloth |
| PET / Macrolon / plexiglass | Vacuum cleaner and antistatic spray | Vacuum, then spray with antistatic spray and rub off. |

**⚠ CAUTION**

**If other cleaning agents or cleaning methods than those mentioned above are used, the components can get permanently damaged so that the proper function of the bowl feeder is no longer guaranteed.**

**⚠ WARNING**

**The following requirements must be met during the cleaning :**

- **Wear safety goggles**
- **Provide sufficient ventilation when cleaning with volatile substances**

## 6.3 Replacing springs or spring packages

(See Figure 15)

This procedure is only necessary when:

- the oscillating behavior of the WV has changed
- a spring is broken
- the WV is to be retooled for a different product

| WARNING | |
|---|---|
| | **Before removing the casing, unplug the mains cable!** |

1. Remove the casing (1) (see Figure 15)
2. Remove the screws (2) from the spring package to be replaced
3. Reassemble the spring package

The relevant spring cross-section can be taken from chapter 3.4.

| NOTE | |
|---|---|
| | **Do not forget the spring spacers (3)!** |

| NOTE | |
|---|---|
| | **If a spring was broken, the number and thickness of the springs must correspond to the old package.** |

| NOTE | |
|---|---|
| | **Opposite opposed spring packages must contain the same springs!** |

4. mount the spring package and tighten the screws (2)
5. check the air gap between the magnetic coil and the anchor bolt and reset if necessary (see chapter 6.5)
6. replace the casing (**1**) and carry out a test run (see chapter 5.1)

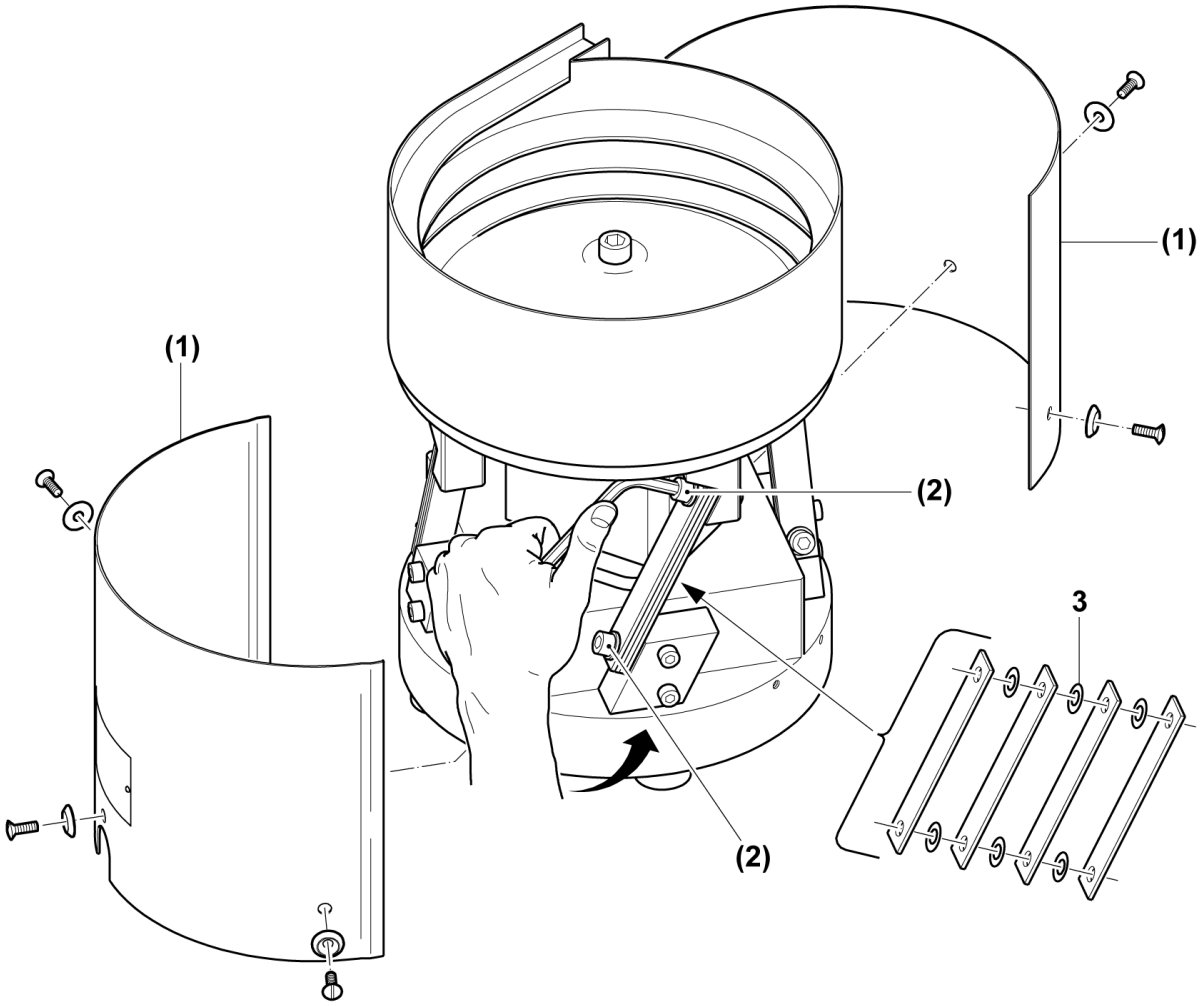



**Figure 15**

## 6.4 Replacing the magnetic coil

This procedure is only necessary when:

- The magnetic coil is defective

| WARNING | |
|---|---|
| | **Before removing the casing, unplug the mains cable!** |

| WARNING | |
|---|---|
| | **Electrical work must only be carried out by trained personnel!** |

1. Remove the casing (1) (see Figure 16)
2. Unplug the Euro plug (2) from the control unit and disassemble. (see Figure 17)
3. Unscrew the cable clamp (3) and pull the cable through. (see Figure 17)
4. remove the screws (4) and exchange the magnet (5) (see Figure 18)
5. Insert new magnet and retighten the screws (4) (see Figure 18)
6. Reassemble in the reverse order.

| NOTE | |
|---|---|
| | **This procedure generally includes adjustment of the air gap between the magnetic coil and the anchor bolt (see chapter 6.5)** |

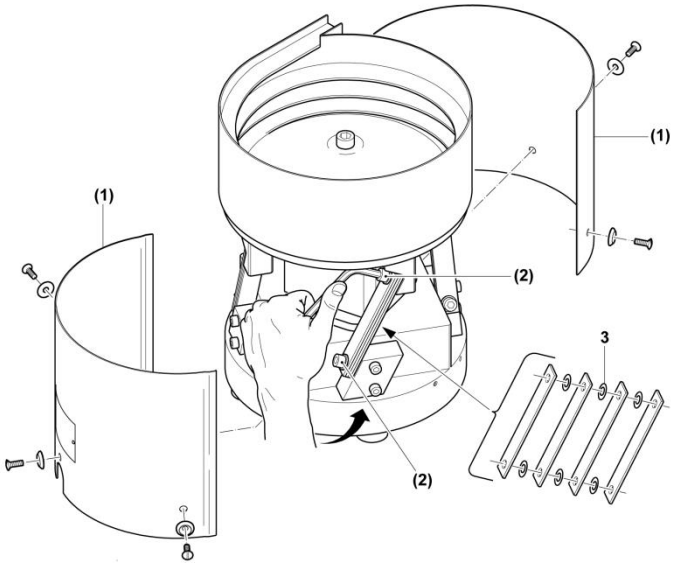



**Figure 16**

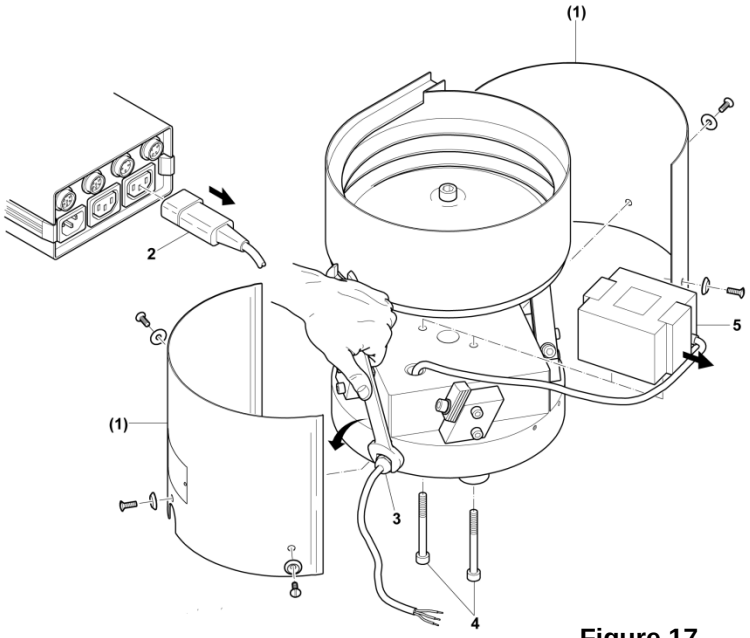



**Figure 17**

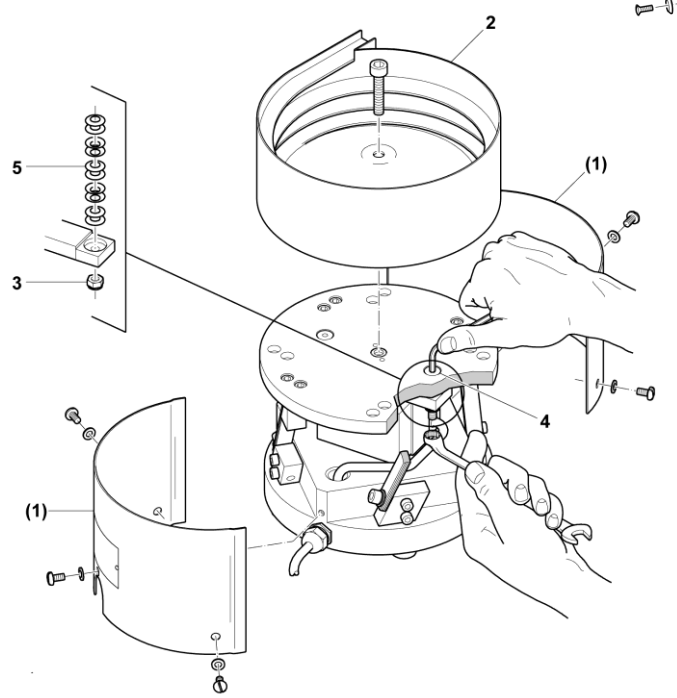



**Figure 18**

## 6.5 Setting the air gap between magnetic coil and anchor bolt

### 6.5.1 Setting the air gap for WV151-1

This procedure is only necessary when:

- the vibration plate has been reset to the support base
- springs or spring packages have been replaced
- the magnetic coil has been replaced

| **WARNING** | |
|---|---|
| | **Before removing the casing, unplug the mains cable!** |

1. remove the casing (1) (see Figure 19)
2. remove the bowl (2) (see Figure 19)
3. Place a ring spanner (size 8) on the Hex stop nut (3) and use an Allen key (size 3) to turn the countersunk screw (4) in the desired direction against the disc springs (5) (see Figure 19)
4. Use a feeler gauge (8) to set the air gap between the magnetic coil (6) and the anchor bolt (7) to between 0.3mm and 0.5mm (see Figure 20)

| **NOTE** | |
|---|---|
| | **Set the anchor bolt so that there is a parallel air gap between the magnetic coil and the anchor bolt.** |

5. mount the casing (1) and the bowl (2)

If the magnetic coil and anchor bolt clash together, then **the air gap is too small**

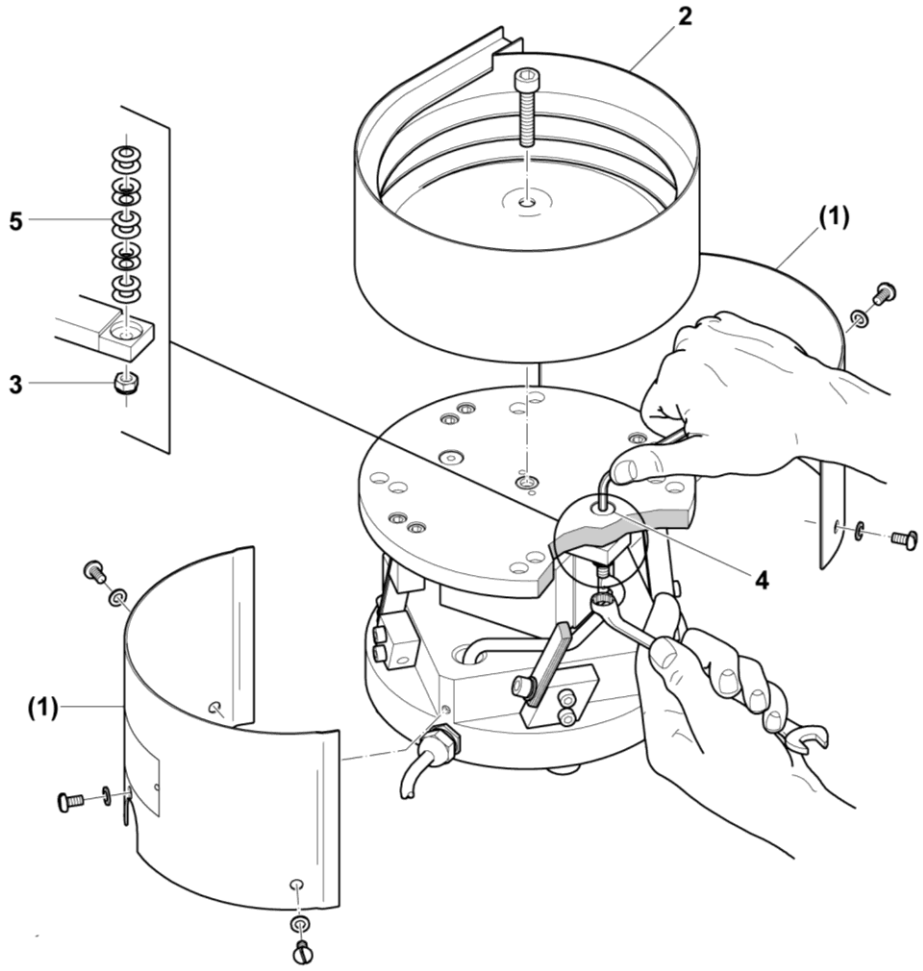



**Figure 19**

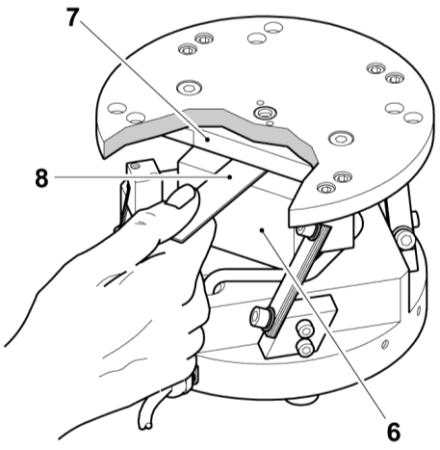



**Figure 20**

### 6.5.2 Setting the air gap for WV201-1 / 310-1

This procedure is only necessary when:

- the vibration plate has been reset to the support base
- springs or spring packages have been replaced
- the magnetic coil has been replaced

| **WARNING** | |
|---|---|
| | **Before removing the casing, unplug the mains cable!** |

1. remove the casing (1) (see Figure 21)
2. use a ring spanner (size 13) to loosen hex nuts (2) and (3). Now turn the hex nuts in the appropriate direction to alter the air gap. Afterwards, lock the two hex nuts together. (see Figure 21)
3. Use a feeler gauge (6) to set the air gap between the magnetic coil (4) and the anchor bolt (5) to between: (see Figure 22)

   WV201-1 = 0.3 - 0.7 mm

   WV310-1 = 0.3 - 0.8 mm

| **NOTE** | |
|---|---|
| | **Set the anchor bolt so that there is parallel air gap between the magnetic coil and the anchor bolt.** |

4. replace the casing (1)

If the magnetic coil and anchor bolt clash together, then **the air gap is too small**.

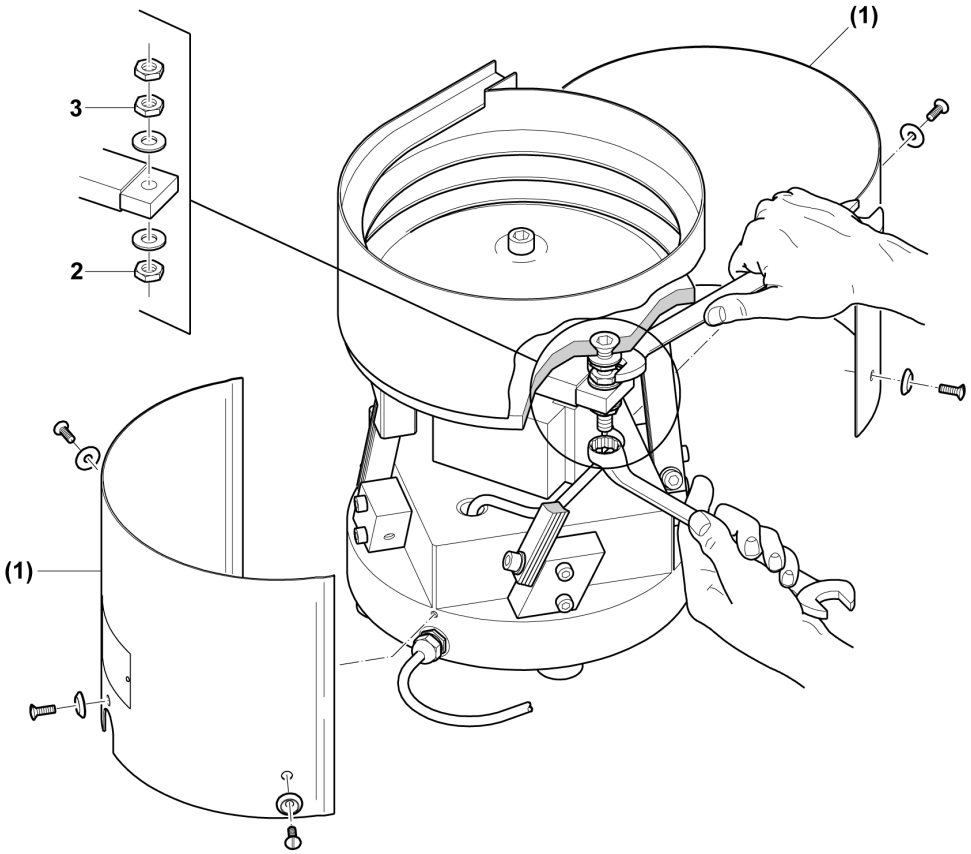



**Figure 21**

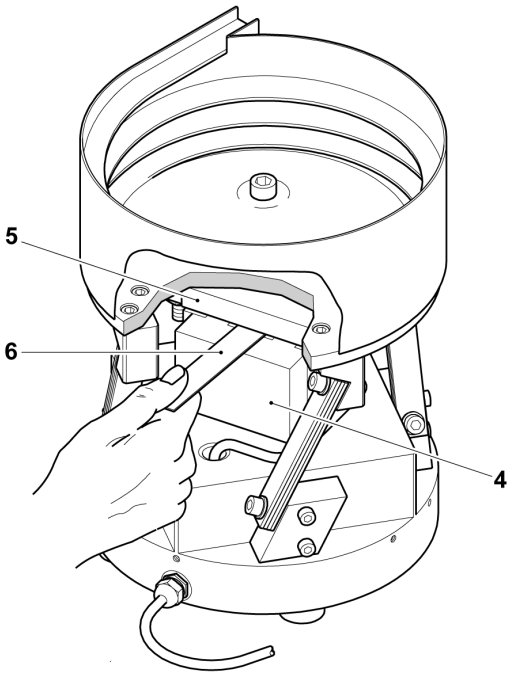



**Figure 22**

## 6.6 Wear and Spare parts

**Table 2:** *Wear parts*

| Pos. | Type | Designation | Order number | | |
|---|---|---|---|---|---|
| | | | WV151-1 | WV201-1 | WV310-1 |
| 8 | Leaf spring | 0,5 mm | 11006710 | - | - |
| | | 1 mm | 11006711 | - | - |
| | | 2 mm | - | 11006736 | |
| | | 3 mm | - | 11006738 | |
| 11 | Rubber buffer | M5 | 11006834 | - | - |
| | | M6 | - | 11006838 | |
| 26 | Spring pad | 0,2 mm | - | 11006741 | |

**Table 3:** *Spare parts*

| Pos. | Type | Designation | Order number | | |
|---|---|---|---|---|---|
| | | | WV151-1 | WV201-1 | WV310-1 |
| 3 | Magnet | 230 V / 50 Hz | 11007478 | 11007482 | 11007482 |
| | | 115 V / 60 Hz | On request | On request | On request |

# 7 Accessories

## 7.1 Mounting parts

**Table 4:** *Order data*

| Type | Designation | Order number | | |
|---|---|---|---|---|
| | | WV151-1 | WV201-1 | WV310-1 |
| Centring brackets (4) | | 50251550 | | 50251542 |
| Spacers | 5 mm | 50021483 | | |
| | 10 mm | 50021486 | | |
| | 20 mm | 50021484 | | |
| Spacer gauge | | On request | | |

## 7.2 Control device

The WV is connected to the 230V/50Hz AC system via an IRG or MSG controller and can be rated for other mains voltages and frequencies, e.g. 115V/60Hz. They operate in full-wave mode at double mains frequency, i.e. at 50Hz AC, with a vibration frequency of 100Hz, in half-wave mode at single mains frequency with a vibration frequency of 50Hz.

Vibration displacement and thus the transport speeds are infinitely adjustable due to magnet current and thus magnetic force variability.

Soft-starting, all IRG and MSG types can be mounted in various different ways and offer extra controls for photoelectric barriers, initiator elements, or extern 24VDC signal. For a detailed description of the controllers refer full-range catalogue from AFAG GmbH.

Third-party controllers can also be used as long as they meet the technical requirements.

**Table 5:** *Controllers for WV- Bowl feeder*

| Type | Power supply | Order number | Comments |
|---|---|---|---|
| IRG1-S | 230V/50Hz | 50360105 | Control with no timer function<br>External target value preset |
| | 115V/60Hz | 50360106 | |
| MSG801 | 230V/50Hz – 115V/60Hz | 50391818 | With timer function, valve and interface outputs, sensor feed |
| MSG802 | 230V/50Hz – 115V/60Hz | 50391819 | With sensor feed |

### 7.3 Address for orders

**Germany:**

Afag GmbH

Wernher-von-Braun-Straße 1

D – 92224 Amberg

Tel.: ++49 (0) 96 21 / 65 0 27-0

Fax: ++49 (0) 96 21 / 65 0 27-490

**Sales**

sales@afag.com

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**Switzerland:**

Afag Automation AG

Zuführtechnik

Fiechtenstrasse 32

CH – 4950 Huttwil

Tel.: ++41 (0) 62 / 959 86 86

Fax: ++41 (0) 62 / 959 87 87

## 8 Disposal

WV feeders that are no longer in use should not be disposed of as complete units but dismantled into separate materials and recycled. Non-recyclable components must be disposed of correctly.